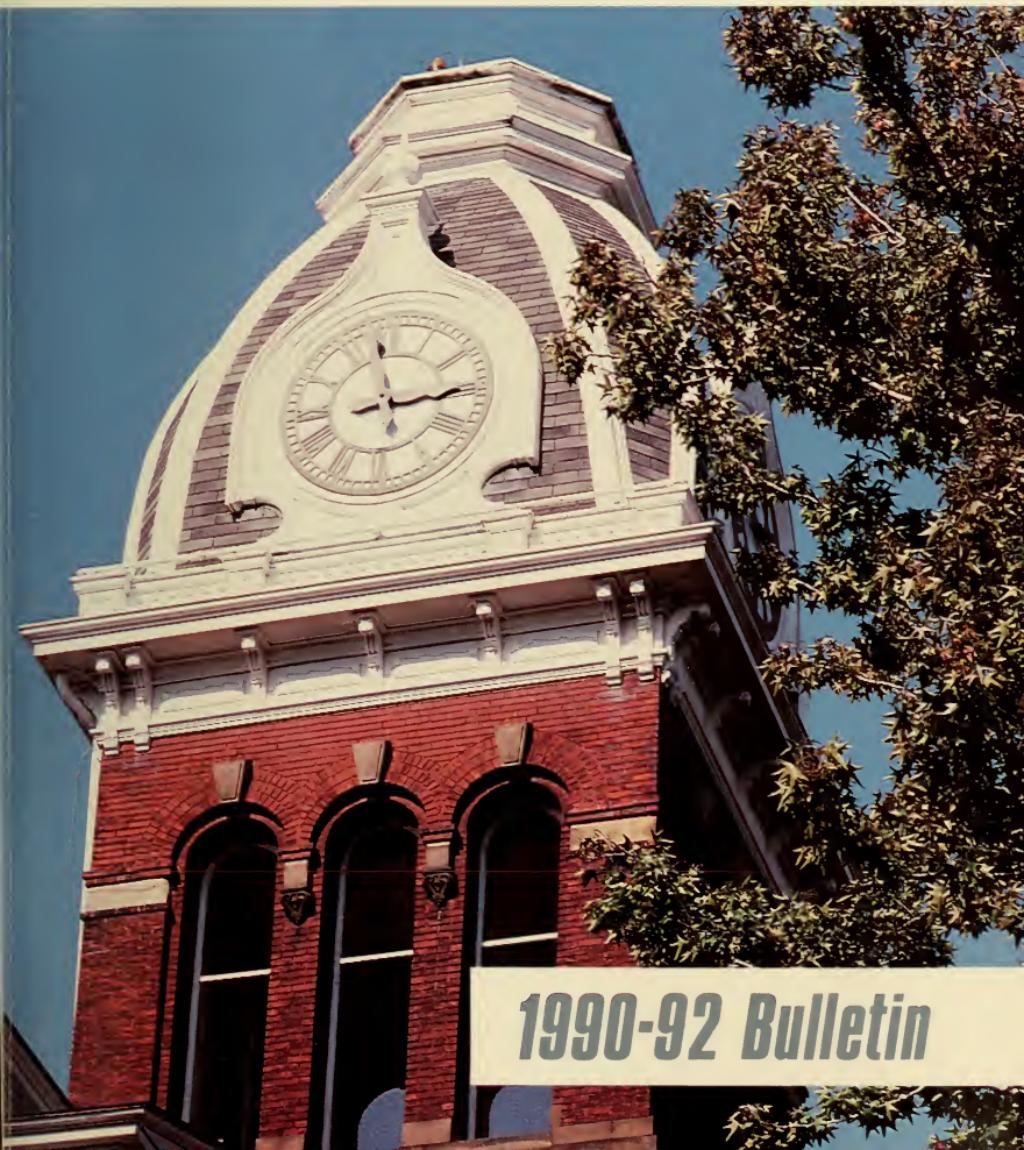


WEST VIRGINIA UNIVERSITY

*Graduate
Catalog*



Fulfilling Our Mission

Teaching · Research · Public Service



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WEST VIRGINIA UNIVERSITY

1990-92 Graduate Catalog

West Virginia University does not discriminate on the grounds of race, color, national origin, sex, age, veteran status or handicap in the administration of any of its educational programs, activities, or with respect to admission and employment. Inquiries may be directed to the Section 504, Title IX Coordinator, Office of the President, (304) 293-4160.

This **two year** bulletin represents the planned schedules and offerings for 1990 through 1992.

The 1990-92 West Virginia University Graduate Catalog, published by Publications Services, is a general source of information about course offerings, academic programs and requirements, expenses, rules, and policies. The courses, requirements, and regulations contained herein are subject to continuing review and change by the University of West Virginia Board of Trustees, University administrators, and the faculties of the schools and colleges to best meet the goals and objectives of the University. The University, therefore, reserves the right to change, delete, supplement, or otherwise amend at any time the information, course offerings, requirements, rules, and policies contained herein without prior notice.

UNIVERSITY CALENDAR, 1990-91

Summer Sessions, 1990

May 21, Monday	Registration, First Summer Session
May 21, Monday	First Classes
May 28, Monday	Memorial Day Recess
June 29, Friday	Final Exam for First Six-Week Session
July 2, Monday	Registration, Second Summer Session
July 2, Monday	First Classes
July 4, Wednesday	Independence Day Recess
August 10, Friday	Final Exam for Second Six-Week Session

First Semester, 1990

August 16, 17, Thursday and Friday	New Student Orientation
August 17, Friday	General Registration
August 20, Monday	First Classes
August 20, Monday	Late Registration Fee in Effect for All Students
August 24, Friday	Last Day to Register, Add New Courses, Make Section Changes, Change Pass/Fail and Audit
September 3, Monday	Labor Day Recess
September 10, Monday	Faculty Assembly
September 20, Thursday	Rosh Hashannah—Day of Special Concern
September 29, Saturday	Yom Kippur—Day of Special Concern
October 5, Friday	Mid-Semester
October 9, Tuesday	Mid-Semester Reports Due
October 26, Friday	Last Day to Drop a Class
November 6, Tuesday	Election Day Recess
November 17, Saturday, to November 25, Sunday, inclusive	Thanksgiving Recess
December 6, Thursday	Last Day to Withdraw From University
December 7, Friday	Last Day of Classes
December 10, Monday, to December 15, Saturday, inclusive	Final Examinations
December 16, Sunday, to January 3, Thursday, inclusive	Christmas Recess

Second Semester, 1991

January 4, Friday	General Registration
January 7, Monday	First Classes
January 7, Monday	Late Registration Fee in Effect for All Students
January 11, Friday	Last Day to Register, Add New Courses, Make Section Changes, Change Pass/Fail and Audit
January 21, Monday	Martin Luther King, Jr. Birthday Recess
February 7, Wednesday (Not a Holiday)	West Virginia University Day
February 22, Friday	Mid-Semester
February 26, Tuesday	Mid-Semester Reports Due
March 9, Saturday, to March 17, Sunday, inclusive	Spring Recess
March 22, Friday	Last Day to Drop a Class
March 29, Friday	Friday Before Easter Recess
March 30, Saturday	Passover—Day of Special Concern
April 25, Thursday	Last Day to Withdraw From University
April 26, Friday	Last Day of Classes
April 29, Monday, to May 4, Saturday, inclusive	Final Examinations
May 6, Monday	Grade Reports for All Graduates Due in Dean's Office
May 6, Monday	Dean's Reports for All Graduates Due in Office of Admissions and Records
May 11, Saturday	Alumni Day
May 12, Sunday	Commencement

The WVU academic year is divided into two semesters of about seventeen weeks each and two summer sessions of six weeks each.

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Graduate Programs

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West Virginia University
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Morgantown, WV 26506-6001

Scholarships and Work-Study

Student Financial Aid Office
West Virginia University
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Morgantown, WV 26506-6004

Veterans Educational Assistance

Student Financial Aid Office
West Virginia University
P.O. Box 6004
Morgantown, WV 26506-6004

TENTATIVE UNIVERSITY CALENDAR, 1991-92

Summer Sessions, 1991

May 20, Monday	Registration, First Summer Session
May 20, Monday	First Classes
May 27, Monday	Memorial Day Recess
June 28, Friday	Final Exam for First Six-Week Session
July 1, Monday	Registration, Second Summer Session
July 1, Monday	First Classes
July 4, Thursday	Independence Day Recess
August 9, Friday	Final Exam for Second Six-Week Session

First Semester, 1991

August 22, 23, Thursday and Friday	New Student Orientation
August 23, Friday	General Registration
August 26, Monday	First Classes
August 26, Monday	Late Registration Fee in Effect for All Students
August 30, Friday	Last Day to Register, Add New Courses, Make Section Changes, Change Pass/Fail and Audit
September 2, Monday	Labor Day Recess
September 9, Monday	Faculty Assembly
September 9, Monday	Rosh Hashannah—Day of Special Concern
September 18, Wednesday	Yom Kippur—Day of Special Concern
October 11, Friday	Mid-Semester
October 15, Tuesday	Mid-Semester Reports Due
November 1, Friday	Last Day to Drop a Class
November 23, Saturday, to December 1, Sunday, inclusive	Thanksgiving Recess
December 12, Thursday	Last Day to Withdraw From University
December 13, Friday	Last Day of Classes
December 16, Monday, to December 21, Saturday, inclusive	Final Examinations
December 22, Sunday, to January 9, Thursday, inclusive	Christmas Recess

Second Semester, 1992

January 10, Friday	General Registration
January 13, Monday	First Classes
January 13, Monday	Late Registration Fee in Effect for All Students
January 17, Friday	Last Day to Register, Add New Courses, Make Section Changes, Change Pass/Fail and Audit
January 20, Monday	Martin Luther King, Jr. Birthday Recess
February 7, Friday (Not a Holiday)	West Virginia University Day
February 28, Friday	Mid-Semester Reports Due
March 3, Tuesday	Mid-Semester Reports Due
March 14, Saturday, to March 22, Sunday, inclusive	Spring Recess
March 27, Friday	Last Day to Drop a Class
April 17, Friday	Friday Before Easter Recess
April 18, Saturday	Passover—Day of Special Concern
April 30, Thursday	Last Day to Withdraw From University
May 1, Friday	Last Day of Classes
May 4, Monday, to May 9, Saturday, inclusive	Final Examinations
May 11, Monday	Grade Reports for All Graduates Due in Dean's Office
May 11, Monday	Dean's Reports for All Graduates Due in Office of Admissions and Records
May 16, Saturday	Alumni Day
May 17, Sunday	Commencement

The WVU academic year is divided into two semesters of about seventeen weeks each and two summer sessions of six weeks each.

Part 1

Government and Organization of WVU

The University of West Virginia Board of Trustees is vested by law with the authority for the control and management of the University and certain other state institutions of higher education. Serving on the Board are eleven members appointed by the Governor, with advice and consent of the Senate, and five ex-officio members including a faculty member chosen by the Trustees' Advisory Council of Faculty, a staff member representing the Trustees' Advisory Council of Classified Staff, and a student named by the Trustees' Advisory Council of Students and the State Superintendent of Schools.

The president, appointed by the Board of Trustees, is the chief executive officer of the University.

The University's 11-member Board of Advisors reviews all WVU proposals involving its mission, academic programs, budget, capital facilities, institution-wide personnel policies, and other matters requested by the president. The Board of Advisors also serves as the search and screening committee for new university presidents under guidelines established by the Board of Trustees (in this role, the Board of Advisors appoints three additional WVU faculty and the Board of Trustees appoints three additional members to comprise a 17-member committee).

The Faculty Senate is the vehicle for faculty participation in the governance of the University. It has original jurisdiction over all matters of academic interest and educational policy that concern the entire University or affect more than one college or school. The senate's decisions are subject to review and approval by the president and the Board of Trustees. Senators are elected by members of the University faculty to represent their colleges and other constituencies. Each constituency is entitled to one senator for twenty members of the University faculty. The senate normally meets the second Monday of each month.

The senate elects a faculty chair each year to preside over the meetings of the senate and the executive committee. Three faculty members also serve on the Vice Presidents' Advisory Committee for Promotion and Tenure.

The president meets regularly with the cabinet and monthly with the Faculty Senate Executive Committee, the staff council, and student administration.

The University Faculty Assembly includes the president as presiding officer, vice presidents, academic deans, associate deans, professors, associate professors, assistant professors, and instructors holding appointments on a full-time basis. The assembly meets once a year in September.

West Virginia University also has a tradition of strong student administration that touches all aspects of student life and represents student opinion to the administration and faculty. Student administration has three main units: the executive branch, the 11-member board of governors, and the judicial board. Students also serve on University-wide committees and on the Mountainlair Advisory Council.

Non-teaching employees belong to the staff council, which consists of twelve members elected by their fellow employees in six occupational groups, or to Laborers' International Union Local 814, AFL-CIO, which represents many employees.

Stephen Haid, Secretary; Department of Education and the Arts

University of West Virginia Board of Trustees

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College of Agriculture and Forestry

Robert H. Maxwell, Ph.D., Dean; Director of Agricultural and Forestry Experiment Station

Kenneth D. McIntosh, Ph.D., Associate Dean, Academic Affairs

Alfred L. Barr, Ph.D., Associate Director, Agricultural and Forestry Experiment Station

The College of Agriculture and Forestry is divided into six divisions of study: animal and veterinary sciences, family resources, forestry, plant and soil sciences, resource management, and international agriculture and forestry. The college's faculty and staff are located in three major buildings on the Evansdale campus, on four farms owned by the College of Agriculture and Forestry in the Morgantown area, and in nearby Cooper's Rock State Forest.

The college and its curricula stress applied ecology, man-made structures, and relationships among humans as they live and work in various environments. The student of agriculture and forestry studies many different subjects concerned with human behavior, plants, animals, and microbes that interrelate with and affect our environment. The study of ecology is interwoven throughout the courses offered in the college to give the student a comprehensive understanding of the basic elements at work in our environment.

The college, too, is the site of the state's Agricultural and Forestry Experiment Station, so the University maintains extensive land for research purposes. This land is divided into areas devoted to dairy, livestock, poultry, forestry, wildlife, horticulture, agronomy, and soils. Students and professors use these areas regularly for instruction and research, and information generated at these holdings is used to update subject matter in the classroom.

The College of Agriculture and Forestry offers two doctoral programs, one in agricultural sciences and one in forest resource sciences. Currently, the agricultural sciences program allows students to choose among the following areas for doctorate study: agricultural biochemistry, agricultural microbiology, agronomy, animal nutrition, and plant pathology. In the forest resource sciences program, students can choose an area of emphasis among the following: forest resource management, wildlife and fisheries management, and wood science.

In addition to the Ph.D. programs in agricultural sciences and forest resource sciences, the College of Agriculture and Forestry participates in two interdisciplinary doctoral programs: genetics and developmental biology and reproductive physiology.

The College of Agriculture and Forestry offers thirteen programs leading to a master of science degree. Students can choose among the following areas for a master's degree: agricultural biochemistry, agricultural economics, agricultural education, agricultural microbiology, agronomy, animal and veterinary sciences, entomology, family resources, forestry, horticulture, plant pathology, recreation and parks management, and wildlife and fisheries management. In addition, students can choose to study under the master of agriculture program or elect to pursue a master's degree in the interdisciplinary areas of reproductive physiology or genetics and developmental biology.

For additional information concerning any of the graduate programs in Agriculture and Forestry contact: Associate Dean, Coordinator of Graduate Studies, College of Agriculture and Forestry, West Virginia University, Morgantown, WV 26506; telephone (304) 293-2691

College of Arts and Sciences

Gerald E. Lang, Ph.D., Dean

Shirley Dowdy, Ph.D., Associate Dean

John F. Schnabel, Ph.D., Associate Dean

Frank J. Calzonetti, Ph.D., Assistant Dean

Nicholas G. Evans, Ph.D., Assistant Dean

The College of Arts and Sciences is West Virginia University's largest college with more than 300 faculty in 17 academic departments in literature and the humanities, social and behavioral sciences, and mathematics and natural sciences. The college supports ten doctoral programs and 16 master's programs; its departments occupy 12 buildings in the downtown campus area of Morgantown. The faculty of the college are actively involved in scholarship and research and are at the frontiers of their respective fields of knowledge and exploration. Several faculty members have received nationally-recognized awards for their teaching and research efforts. These awards not only acknowledge extreme dedication but also accentuate the relationship between the faculty and the students. Graduate students often collaborate with faculty on specialized research projects which lead to publications in national and international journals. In 1988, the faculty published over 25 books and more than 300 articles, delivered 390 professional presentations, and received 83 grants, 67 academic honors, and 72 professional association citations. Sponsored research activity has increased yearly for the past five years and now exceeds \$2 million annually.

The College of Arts and Sciences offers doctoral programs in biology, chemistry, computer science, English, geology, history, mathematics, physics, political science, and psychology. Available research or teaching concentrations are as follows:

- Biology—cellular and molecular.
- Chemistry—analytical, inorganic, organic, physical, and theoretical chemistry.
- Computer science—artificial intelligence.
- English—literature in preparation for teaching.
- Geology—sedimentary basin analysis and the Appalachian province.
- History—historiography, research methods, and interpretation.
- Mathematics—discrete and applied mathematics.
- Physics—condensed matter, applied physics, plasma physics, astrophysics, nuclear models, and elementary particle physics.
- Political science—teaching or public service management and policy analysis.
- Psychology—behavior analysis, developmental psychology, and clinical psychology.

Graduate programs leading to a master's degree are available in biology, chemistry, communication studies, computer science, English, foreign languages, geography, geology, history, liberal arts, mathematics, physics, psychology, public administration, sociology and anthropology, and statistics. Each program prepares students for further study or for productive roles in professional environments.

Information concerning graduate programs in the College of Arts and Sciences may be obtained by contacting: Assistant Dean for Research and Graduate Studies, College of Arts and Sciences, 201 Woodburn Hall, West Virginia University, Morgantown, WV 26505; telephone (304) 293-4611.

College of Business and Economics

Cyril M. Logar, D.B.A., Dean

Gail A. Shaw, C.P.A., Ph.D., Associate Dean

Richard M. Gardner, M.B.A., Assistant Dean

Jay H. Coats, Ph.D., Director of Graduate Programs

In the 1990-91 academic year, business and economics classes for the first time will be held in a new building designed particularly to meet the needs of the College of Business and Economics. Our facility houses modern classrooms, two auditoriums, state-of-the-art computer laboratories, and space for our research and service centers. The College offers quality professional programs for graduate students. The College does so by developing and maintaining up-to-date programs, recruiting outstanding students, serving their course needs, and meeting or exceeding standards of excellence set by the American Assembly of Collegiate Schools of Business (AACSB).

The College offers the only business programs in West Virginia that are accredited by AACSB, which assures students and prospective employers that our programs adhere to the highest standards of excellence for business programs. The College has maintained full membership accreditation in the AACSB since 1954.

Because students are our most valuable resource and our most valuable product, our mission centers around preparing them for professional careers in business, industry, government, and education. The College administration and faculty work with the WVU Career Services Center and private employers to place our graduates in rewarding professional positions.

The master of arts and doctor of philosophy degrees in economics prepare students for careers in business, government, and higher education. Students receive in-depth training in the concepts and methods of economic analysis and also study business analysis, public policy, mathematical economics, labor economics, environmental economics, public finance, and econometrics. These programs are well-suited to students with undergraduate degrees in economics, finance, mathematics, statistics, public policy, history, and other humanities majors. The MBA program is especially attractive for the student with a non-business undergraduate major since no business courses are prerequisite for admission. Coursework includes an even exposure to all of the functional areas of management and provides a broad, general management orientation. The master of science in industrial and labor relations program provides a flexible, interdisciplinary education for the student desiring a career in human resources management (industrial and labor relations). All undergraduate majors are acceptable. Areas of study may include the functional areas of business, counseling, law, safety, sociology, and others. The MPA program is available to students with undergraduate degrees in accounting. The program follows the AICPA's recommendations for a five-year accounting education and meets the requirements of all states with 150-hour requirements for CPA certification. Each of the master's programs can be completed by a full-time student in one to one and a half years. The MBA program is also available on a weekend basis at four locations in West Virginia.

Specific information about graduate programs in the College of Business and Economics may be obtained from the Graduate Program Office, Room 333 Business and Economics Building, P.O. Box 6025, West Virginia University, Morgantown, WV 26506-6025. The phone number is (304) 293-5408.

College of Creative Arts

Margaret O. Lucas, Ed.D., Dean

Richard W. Phalunas, Jr., Ed.D., Special Assistant to the Dean

The College of Creative Arts, composed of the Divisions of Art, Music, and Theatre, serves an academic and cultural function which provides an educational and interdisciplinary environment for the exploration, advancement, and understanding of the visual and performing arts. A distinguished faculty of actors, artists, composers, conductors, directors, instrumentalists, vocalists, and writers bring to the College a commitment to a creative process of artistic growth which is shared with each student. Through teaching, research, and service, the faculty of the college provide students the professional preparation to enable achievement of the highest level of performance, scholarly research, and creative activity. Graduate programs in art, music, and theatre are characterized by quality and diversity of faculty, students, and curricular opportunity. Each division is an accredited member of the nationally recognized accrediting agency for professional instruction in the discipline: art programs are accredited by the National Association of Schools for Art and Design; music programs are accredited by the National Association of Schools of Music; and theatre is accredited by the National Association of Schools of Theatre.

The College of Creative Arts is also committed to providing the highest levels of creative, intellectual, and cultural experiences in art, music, and theatre to the University, the state, and the region. In an environment rich with art exhibitions, concerts, and plays, students gain the knowledge, skills, experience, and inspiration necessary for professional success. Students, faculty, and visiting artists present a full calendar of performances and exhibitions open to the public. The Creative Arts Center, which houses the college, is a modern, multi-million dollar instructional and performance facility with three theatres, two recital halls/recording studios; scenery, painting, drawing, design, costume, printmaking, sculpture, ceramic, and instrumental studios; additional art studios; and two art galleries.

The Ph.D. curriculum in music prepares students for careers as teachers in higher education; the D.M.A. curricula in performance and literature (piano, organ, voice) or composition prepare students who seek advanced training while also aspiring to teaching careers in higher education. The master of fine arts is a terminal degree in art and in theatre which prepares students for careers in ceramics, graphic design, painting, printmaking, sculpture, acting, or theatre design/technology.

The master of music enhances undergraduate programs in performance, music education, theory, music history, and composition. The master of arts has concentrations in art education, art history, and studio art.

For further information, please contact: Graduate adviser, Division of Art at (304) 293-2140

Director of graduate studies in music, Division of Music at (304) 293-5511
Chair, Division of Theatre at (304) 293-2020

Our mailing address is Creative Arts Center, West Virginia University, Morgantown, WV 26506-6111.

School of Dentistry

Dr. W. Robert Biddington, D.D.S., Dean
Dr. Henry J. Bianco, D.D.S., Associate Dean
Dr. William L. Graham, D.D.S., Associate Dean
Dr. William R. McCutcheon, D.D.S., Associate Dean
Dr. James E. Overberger, D.D.S., Associate Dean
Dr. Frank H. Stevens, D.D.S., Assistant Dean

The School of Dentistry was established by an act of the West Virginia Legislature on March 9, 1951 and offers baccalaureate, professional, and advanced degrees. The school is located on the first floor of the Health Sciences Center North. Modern clinical facilities include over 140 treatment areas, and a new state-of-the-art preclinical simulation teaching laboratory.

The majority of the faculty are full-time and have had advanced education in all of the recognized specialty areas. All programs are fully accredited by the Commission on Accreditation of the American Dental Association. The School will be expanding its specialty and research areas as additional space and funds become available.

The School of Dentistry offers several advanced education programs beyond the D.D.S. and B.S. degrees.

The Department of Endodontics offers a program of advanced study and clinical training leading to the master of science. The program requires a minimum of 24 months (two academic years and two summer sessions) of full-time residency in the School of Dentistry. It is designed to qualify dentists for careers in endodontic clinical practice, teaching, and research.

The Department of Orthodontics offers a program of advanced study and clinical training leading to the degree of master of science. The program requires a minimum of 34 months (three academic years and two summers) of full-time residency in the School of Dentistry. It is designed to qualify dentists for careers in orthodontic clinical practice, teaching, and research.

The Department of Dental Hygiene offers a program of advanced study and specialized training leading to the degree of master of science. The program requires the completion of a minimum of 36 semester hours through full-time or part-time enrollment in the School of Dentistry. It is designed to qualify dental hygienists for careers in teaching, administration, research and management.

The Department of Oral and Maxillofacial Surgery offers one four-year residency. Seven one-year general practice residencies also are offered by the School of Dentistry. Continuing education courses are offered throughout the year. Information concerning admission requirements and courses of study in the M.S. program may be obtained from the Office of the Associate Dean for Research and Graduate Affairs, WVU School of Dentistry, Morgantown, WV 26506; telephone (304) 293-4719.

College of Engineering

Curtis J. Tompkins, Ph.D., Dean

John T. Jurewicz, Ph.D., Associate Dean for Academic Affairs and Research

The College of Engineering programs are administered through the Departments of Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, Industrial Engineering, and Mechanical and Aerospace Engineering.

Graduate programs, dedicated to the development of engineering practice, science, and research, emphasize numerous creative specialities. These programs, on which knowledge is explored through study and research, provide an environment in which all programs are updated constantly to give students the professional education needed in a technological-scientific society.

The Engineering Sciences Building, on the Evansdale Campus, is adjacent to the Engineering Research Building, which became operational in 1990 and which provides approximately 45,000 additional square feet of space for research. The facility is available for use by all disciplines.

The Ph.D. degree is awarded upon completion of a program of advanced study that includes a minimum of two semesters of continuous on-campus residence, submission of an acceptable dissertation, and the successful completion of comprehensive and final oral examinations.

Designated master's degrees are offered in aerospace, chemical, civil, electrical, industrial, and mechanical engineering. In addition, a master of science in engineering degree is offered to qualified students whose baccalaureate work was done in a field other than engineering, and a master of science degree is offered in occupational health and safety engineering under the auspices of the industrial engineering department. A certificate in manufacturing systems engineering is offered for candidates working on MSEE, MSIE, and MSME degrees.

The Accreditation Board for Engineering and Technology is recognized by the U.S. Department of Education and the Council on Postsecondary Accreditation as the sole agency responsible for accreditation of educational programs leading to degrees in engineering. ABET accomplishes its accreditation mission through the Engineering Accreditation Commission.

ABET, through its participating bodies (American Academy of Environmental Engineers, American Congress on Surveying and Mapping, American Institute of Aeronautics and Astronautics, Inc., American Institute of Chemical Engineers, American Institute of Industrial Engineers, Inc., American Institute of Mining, Metallurgical and Petroleum Engineers, American Nuclear Society, American Society of Agricultural Engineers, American Society of Civil Engineers, American Society for Engineering Education, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., The American Society of Mechanical Engineers, The Institute of Electrical and Electronics Engineers, Inc., National Council of Engineering Examiners, National Institute of Ceramic Engineers, National Society of Professional Engineers, Society of Automotive Engineers, Society of Manufacturing Engineers, and Society of Naval Architects and Marine Engineers) is concerned with the enhancement of the status of the engineer and the engineering profession, and the establishment of criteria and standards for accreditation of engineering programs at colleges and universities.

For specific information about a particular program, students should contact the graduate program coordinator in the area of interest or the Associate Dean for Academic Affairs and Research at (304) 293-4821.

College of Human Resources and Education

Diane L. Reinhard, Ph.D., Dean

Perry D. Phillips, Ed.D., Associate Dean for Professional Preparation

Ernest R. Goeres, Ph.D., Associate Dean for Administration and Finance

Katherine C. Lovell, Ph.D., Assistant to the Dean

John O. Andes, Ed.D., Coordinator, Off-Campus Programs and Graduate Services

The College of Human Resources and Education is located in Allen Hall on the Evansdale Campus. The College is organized into three divisions. The Division of Clinical and Counseling Studies includes the program areas of counseling, counseling psychology, rehabilitation counseling, special education, and speech pathology and audiology. The Division of Education includes the program areas of curriculum and instruction, education administration, elementary education, reading, and secondary education. The Division of Foundations includes the program areas of education foundations, educational psychology, and technology education.

The College brings together several disciplines devoted to the study and maximum development of human talent and resources, whether in the context of the school, the family, or the community. Programs of instruction, research, and extended service are carried out in close cooperation with other related departments and divisions of WVU. The provision of quality programs for professional preparation and professional development in education and human resource fields is a high priority of the College.

The degree of doctor of education (Ed.D.) is a competency-based program. Doctoral students in the College of Human Resources and Education may elect an area of emphasis in counseling psychology, curriculum and instruction, education administration, educational psychology, reading, special education, or technology education. Further information about the specific design of the doctoral program in the above areas is listed in the program description area of the catalog.

For those who desire professional preparation beyond the master's degree but who do not seek the doctoral degree, the College offers programs leading to the certificate of advanced study (CAS). Individuals pursuing the CAS may choose among the following for their area(s) of concentration: administration and supervision, curriculum and instruction, counseling and guidance, educational psychology, reading, or special education.

The College offers master's programs in the areas of counseling, rehabilitation counseling, speech pathology and audiology, education administration, educational psychology, elementary education, reading, secondary education, special education, and technology education.

If you would like additional information about the graduate programs in the College of Human Resources and Education, contact the director of the division most relevant to your program interests.

Division Director, Division of Education, 602 Allen Hall, WVU, Morgantown, WV 26506; telephone (304) 293-3442

Division Director, Division of Foundations, 608 Allen Hall, WVU, Morgantown, WV 26506; telephone (304) 293-2515

Division Director, Division of Clinical and Counseling Studies, 502 Allen Hall, WVU, Morgantown, WV 26506; telephone (304) 293-2807

Perley Isaac Reed School of Journalism

Emery L. Sasser, Ph.D., Dean

Charles F. Cremer, Ph.D., Associate Dean

John H. Boyer, Ph.D., Director of Graduate Studies

The Master of Science in Journalism (M.S.J.) is a program of the School of Journalism, located on the downtown campus in Martin Hall, WVU's oldest building (constructed in 1870). Martin Hall was renovated, refurnished and equipped in 1976-77.

Today, the school has modern broadcast news facilities and state-of-the-art electronic reporting and editing systems.

The faculty, through their educational and professional backgrounds in mass communications studies and media-related experiences, are highly qualified to teach mass communications at both the undergraduate and graduate levels. More than one-half, 57 percent, hold doctorate degrees.

The master program has granted more than 160 degrees since its first, in 1962. The School of Journalism, established in 1939 and one of the oldest in the United States, is one of 90 such programs accredited by the Accrediting Council on Education in Journalism and Mass Communications. The school has a total of more than 3,000 graduates, the majority of whom have careers in newspaper journalism, broadcasting, advertising, public relations or related fields.

The master program offers students the choice of two tracks—the teaching-research track for persons who wish to go on for a doctoral degree and the professional track for those who wish to enhance their professional opportunities in some area of mass communications.

The program, designed to help each student reach full potential as a practitioner, teacher, or scholar in mass communications, prepares a graduate not only for a first job—those who obtain the master's degree should excel in the skills of the profession—but also for long-term productive career development through the study of mass communications and related fields.

The school is in the process of developing more specialized curricula for persons who aspire to become news or public relations specialists in such fields as business, energy and the environment, science, social relations, education, government, international affairs and sports.

Assistantships available in and through the school each year pay stipends and usually provide tuition remission. Graduate assistants teach laboratories and assist professors with courses. Some also work in media-related positions in other programs at WVU.

Those interested in learning about and applying to the master program should contact the Dean, Associate Dean or Graduate Director, School of Journalism, 112 Martin Hall, West Virginia University, Morgantown, WV 26506. Telephone: (304) 293-3505.

For specific admission standards, curricula, or course descriptions, graduation requirements and other detailed information, please refer to the School of Journalism Master Program section of this catalog.

School of Medicine

Robert M. D'Alessandri, M.D., Dean

John W. Traubert, M.D., Associate Dean, Student Affairs

Anthony DiBartolomeo, M.D., Associate Dean, Clinical Affairs

Fred Butcher, Ph.D., Associate Dean, Research and Graduate Education

James Stevenson, M.D., Associate Dean, Continuing Medical Education/Public Relations

James Shumway, Ph.D., Assistant Dean, Curricular Affairs

The West Virginia University School of Medicine shares excellent facilities in the Health Sciences Center with the other health-related professional schools of the University. The Ruby Memorial Hospital offers sophisticated medical technology, including magnetic resonance imagery, lithotripsy, laser surgery, and the necessary support technology. The Chestnut Ridge Psychiatric Hospital and the Mary Babb Randolph Regional Cancer Center provide facilities totally dedicated to the diagnosis and treatment to their fields of specialization. Laboratories and teaching areas allow scientists to work toward their goals. Research areas of anatomy, biochemistry, cellular biology, medical technology, microbiology and immunology, pathology, pharmacology and toxicology, physiology, and the biomedical sciences* support study toward masters of science and doctors of philosophy degrees.

A combined M.D.-Ph.D. program is available to those students who show exceptional interest and scholarly promise. All of the admission requirements of the School of Medicine and the specific graduate program apply. Students should apply for the combined degree program after acceptance to Medical School.

All basic science graduate programs require the submission of scores from the Graduate Record Examination and some may require scores from the applicable advanced test, but in no program are test scores the sole criteria for admission. Prospective graduate students are urged to initiate application for admission as early as possible. The first step is an inquiry to the department offering the program desired; the reply to such an inquiry will include instructions for applying to the particular program.

Initial application must be made for admission to graduate study on standard forms provided by the WVU Office of Admissions and Records. To transfer from one University school or department to another, students may initiate a transfer request by contacting the Health Sciences Center Graduate Programs Office or their advisers. The adviser must contact the Health Sciences Center Graduate Programs Office to complete transfer.

The West Virginia University School of Medicine is accredited by the Liaison Committee on Medical Education of the American Medical Association.

*The Ph.D. in biomedical sciences is offered in conjunction with Marshall University. Please consult the West Virginia University Health Sciences Center Catalog for additional information.

College of Mineral and Energy Resources

John L. Schroder, Jr., M.S.E.M., Dean

Royce J. Watts, M.S., Associate Dean, Administration/Academic Affairs

G. Douglas Elliott, Acting Associate Director, Mining Extension Service

The College of Mineral and Energy Resources has moved to the Evansdale Campus and has occupied a new, state-of-the-art building designed for mineral engineering. Sited at the western end of the Evansdale Campus and in close proximity to the Personal Rapid Transit System Engineering Station, the Creative Arts Center, the existing Engineering Sciences building, and the new Engineering Research Building, the COMER building will provide classroom and auditorium facilities for the College and the Evansdale area, offices and research areas for the Mining Extension Service, offices and teaching and research laboratories for the faculty and academic programs, and the necessary space for personnel and services provided by the administrative group.

The College offers two doctoral programs: mineral engineering and mineral and energy resources.

The principal objective of the Ph.D. program in mineral engineering is the education and training of men and women so that they are capable of attaining the highest levels of the mineral engineering profession and performing the professional roles of developing or improving the efficient extraction of solid mineral resources. The two areas of specialization are mine systems and rock mechanics and ground control.

The primary objective of the Ph.D. program in mineral and energy resources offered by the Department of Mineral Resource Economics is to educate men and women so that they are fully capable of meeting the demands of the highest levels of their professions.

Faculty in mineral resource economics cooperate with faculty in agricultural economics to offer coursework appropriate for students in both programs. Faculty also conduct joint research projects. Graduate students may select faculty in either program to serve on their thesis committee. Such cooperation strengthens the teaching and research of both programs and offers graduate students a wider range of selection in course work and thesis research issues. This also offers opportunities for interactions among graduate students in the two programs and provides for broadened peer experience in study groups and in research discussions and seminars.

The College offers three master of science degree programs. They are the designated M.S. in Engineering of Mines and M.S. in Petroleum Engineering, and the M.S. in mineral and energy resources. The M.S. in Mineral and Energy Resources offers options in mineral processing engineering and in mineral resource economics. The primary objective of each program is to prepare students to fulfill higher levels of responsibility in the mineral industries.

Additional information on the various graduate programs may be obtained by contacting the Associate Dean for Academic Affairs or the Program Chairperson by telephone at (304) 293-5695 or by writing to the College of Mineral and Energy Resources, West Virginia University, P.O. Box 6070, Morgantown, WV 26506-6070.

School of Nursing

Lorita D. Jenab, Ed.D., Dean

Jacqueline Riley, M.S.N., Assistant Dean

The School of Nursing, one of the four professional schools housed at the Health Sciences Center, is accredited by the National League for Nursing. The School of Nursing offers undergraduate and graduate programs of study leading to the B.S.N. and M.S.N. degrees in Morgantown, and via satellite television to selected extension sites. The B.S.N. degree program is also available through a consortium with Glenville State College wherein students complete the lower division portion of the program on the GSC campus and the upper division credit hours are earned on the Charleston campus.

The School of Nursing offers graduates of diploma and associate degree nursing programs the opportunity to complete requirements for the baccalaureate degree in nursing at the Morgantown and Charleston campuses and by extension at Parkersburg and Beckley.

Graduate education in nursing prepares clinicians capable of leadership in developing and expanding nursing knowledge, skills, and practice competencies in light of societal needs. Preparation at the master's level provides the opportunity for the student to demonstrate self-direction and effective interactions with other health professionals in improving nursing practice and the health care delivery system. The master's graduate is able to provide quality health care in a variety of settings while clarifying and redefining nursing roles.

The West Virginia University School of Nursing offers a master's program to prepare professional nurses for the role of nurse clinician in the advanced practice of nursing in primary health care. The Master of Science in Nursing degree is granted by West Virginia University to those who complete the 42 credit hour program.

The M.S.N. program has as its purpose the preparation of professional nurses to assume advanced roles in the delivery of health care; contribute to nursing science; and build a foundation for post-master's study. Upon completion of the program the graduate is expected to:

- Practice nursing based on the conceptual model of the health of human systems dynamically interacting with the environment.
- Synthesize theory, practice, and research in developing the professional role of advanced nurse clinician.
- Demonstrate accountability for health maintenance and promotion to self, the discipline and society.
- Utilize systematic inquiry to guide decision-making related to critical issues impacting clients, the profession, and society.

This non-traditional, integrated graduate program offers a curriculum which allows students to enroll on a part-time or full-time basis. Throughout the curriculum, students are guided in the processes of self-development aimed at pursuing excellence in scholarly and professional endeavors. The program allows flexibility within the basic curricular structure through the individualization of learning experiences, electives, master's paper, thesis, and the opportunity to investigate an area of interest in advanced study.

For further information write: Chairperson, Graduate Academic Unit, West Virginia School of Nursing, Health Sciences Center, Morgantown, WV 26506.

School of Pharmacy

Sidney Rosenbluth, Ph.D., Dean

Frank D. O'Connell, Ph.D., Associate Dean

David Lalka, Ph.D., Assistant Dean for Graduate Research and Programs

James K. Lim, Ph.D., Chairperson, Graduate Admissions/Affairs Committee

The WVU School of Pharmacy offers graduate programs in the pharmaceutical sciences for both the M.S. and Ph.D. It is advantageously located in the Health Sciences Center complex which also houses all departments of the Schools of Medicine, Nursing, and Dentistry, as well as a comprehensive medical library, audiovisual learning center, photo-illustration service, computer facilities, and laboratory animal quarters. The School of Pharmacy maintains its own research laboratories and equipment on three levels within a section of the medical center complex.

Graduate programs in the pharmaceutical sciences are designed to educate competent researchers and teachers. The programs provide flexible, research-oriented curricula designed to develop the interests, capabilities, and potential of the individual student.

Applicants for the Ph.D. may choose among several specialty areas which include medicinal chemistry, pharmaceutics/biopharmaceutics/pharmacokinetics, and behavioral/administrative pharmacy. The pharmaceutical sciences uniquely encompass a wide variety of interrelated areas of science and technology. For example, students in medicinal chemistry are trained to combine knowledge in analytical/synthetic chemistry, biochemistry, pharmacology, pharmacokinetics, and toxicology in the design and synthesis of new drugs, while those specializing in behavioral/administrative pharmacy may integrate sociology, economics, civil law, administration, business management, etc., for developing optimal methods in the delivery of pharmaceutical health care.

Students for the M.S. may specialize in pharmacy administration, pharmacology and toxicology, pharmacognosy, pharmaceutical/medicinal chemistry, industrial pharmacy, and pharmaceutics/biopharmaceutics/pharmacokinetics. As for the Ph.D., students must possess a baccalaureate from a suitable area of study with an overall grade-point average of at least 2.75, and an aptitude and interest for graduate work in the pharmaceutical sciences. Furthermore, GRE scores in the verbal, quantitative, and analytical sections are required. To qualify for the advanced degrees, a cumulative GPA of no less than 3.0 in all graduate courses must be obtained, and with no grade less than a "C" for fulfilling credit hour requirements. Also, a minimum of 30 graduate credit hours, including six hours for research and thesis, must be completed.

The School of Pharmacy is accredited by the American Council on Pharmaceutical Education. The council is composed of members from the American Pharmaceutical Association, National Association of Boards of Pharmacy, American Association of Colleges of Pharmacy, and American Council on Education.

The School of Pharmacy holds membership in the American Association of Colleges of Pharmacy, whose objective is to promote the interests of pharmaceutical education. All of the AACP member institutions must maintain certain requirements for entrance and graduation.

To obtain specific information related to the school's graduate programs, graduate faculty research interests, and availability of graduate assistantships or fellowships, applicants may write directly to: Assistant Dean, Graduate Research and Programs, WVU School of Pharmacy, Health Sciences Center, North, Morgantown, WV 26506; telephone: (304) 293-5101.

School of Physical Education

J. William Douglas, Ph.D., Dean

Dana D. Brooks, Ed.D., Associate Dean

Andrew Sorine, Ed.D., Coordinator of Graduate Studies

The School of Physical Education houses three departments which offer graduate programs leading to the doctor of education and the master of science degrees and to the certificate of advanced studies.

The Department of Health, Physical Education and Athletic Training offers a master's degree in community health with three options: clinical, thesis, or school health. Teacher certification, grades K-12, can also be obtained at the graduate level. A master's degree in professional physical education is offered in the area of motor development/pedagogy, athletic training, and athletic coaching. The doctoral degree in professional physical education is offered in the areas of motor development/pedagogy and in the administration of sport and physical education. Emphasis in all graduate programs focuses on the application of scholarship to "real world" practice.

Graduate studies in the Department of Sport and Exercise Studies include programs leading to the M.S. and Ed.D. degrees. Programs allow students to pursue degrees relative to the study of sport and physical activity in the areas of sport behavior, the concentrated study of the psycho/social dimensions of sport; sport management, the study of effective management related to sport as a business enterprise; and sport physiology, the assessment, evaluation, and prescription of fitness parameters of all age groups participating in physical activity.

The Department of Safety Studies offers the certificate of advanced study and the master's degree in safety management, which is aimed at preparing individuals to serve as safety directors, coordinators, or managers in business, education, government, or industry. The course work is concentrated upon establishing and directing programs designed to facilitate optimal reduction of losses and costs due to a variety of safety-related problems. The certificate of advanced study is aimed at preparing individuals with emphasis in safety management training beyond the master's degree.

The School's state-of-the-art facilities include a swimming complex; laboratories for athletic training, computers, exercise physiology, safety and sport skill analysis; a rifle range and weight training room, as well as excellent classrooms, seminar rooms, studios, and courts.

For additional information, please contact the Graduate Coordinator, School of Physical Education, 278 Coliseum; telephone (304) 293-5045.

School of Social Work

Michael A. Patchner, Ph.D., Dean

Barry L. Locke, Ph.D., Assistant Dean

Patty Gibbs, Ph.D., BSW Program Director

The School of Social Work began as a department in the College of Arts and Sciences in the early 1930s. In 1971, we became an independent school, located in Allen Hall on the Evansdale Campus. Our programs are accredited by the Council on Social Work Education, and our graduates meet the criteria for licensure in most states.

The graduate program in social work offers advanced study and training in preparing social workers for leadership roles in small towns and rural areas. The School of Social Work is nationally recognized in the area of rural social work practice, and the faculty regularly contribute to this field through presentations, papers, conferences, seminars, and research. Students have the opportunity to focus their practice interests by selecting an area of concentration within our MSW program. Currently, the School supports practice concentrations in the areas of aging and long term care, family, and community health and mental health. Students have the opportunity to do their field internships with agencies throughout West Virginia and the Mid-Atlantic region. A dual degree option is also offered in conjunction with the Department of Public Administration of the College of Arts and Sciences. Additionally, the School attracts a number of international students and maintains active relationships with social welfare departments in universities in Korea and Japan.

The School of Social Work supports both full-time and part-time study at the University. Students who have graduated from a baccalaureate program in social work accredited by the Council on Social Work Education may request a review for advanced standing in the MSW program when they apply for admission. Students admitted to the MSW program are not permitted to enroll in 200 level courses to meet graduate degree requirements.

Students interested in applying to the School or wishing additional information should address inquiries to: Assistant to the Dean, School of Social Work, 707 Allen Hall, West Virginia University, Morgantown, WV 26506; telephone: (304) 293-3501.

Part 2

GRADUATE EDUCATION AT WEST VIRGINIA UNIVERSITY

Graduate education has a long and honored history. It can be traced to the medieval universities of Europe, and the goal for graduate study has remained unchanged over the intervening centuries. A student undertakes such study in order to gain a deeper knowledge in a particular academic discipline, and to become able to demonstrate to the faculty and practitioners in the field the attained mastery of knowledge. Consequently, graduate study cannot be defined primarily in terms of semester hours of course work beyond the baccalaureate, even though minimum course work requirements are commonly specified for graduate degrees. Minimum requirements set the lower limit for an integrated plan of study which will provide a student with opportunity for the desired knowledge.

Graduate students are expected to become participating members of the University community. Even when not in class, graduate students traditionally have access to the informal academic activities of their discipline. They are encouraged to attend the talks presented by visiting scholars, to listen to academic discussions of their faculty, to serve on departmental committees, and to study with their fellow graduate students. The purpose of residency requirements is to promote such participation in the academic affairs of the University.

Graduate students enrolled in a graduate program within West Virginia University are expected to participate in a seminar course throughout their graduate career. Depending on the objectives set by a particular graduate program, seminars may:

- Provide an opportunity for the student to be exposed to a variety of topics;
- Give the students insight into the methods by which to communicate the significance of their research;
- Allow the student to hear outside speakers; or
- Engender discussion with faculty concerning research and the development of research methodology.

At WVU the minimum standards for admission to graduate study are set by the University Graduate Council. Beyond this point, however, faculty members in a given graduate program have complete control over who is to be admitted to undertake graduate study under their supervision; and ultimately it is they who certify which students have demonstrated sufficient mastery of the discipline to qualify for a graduate degree. While a student may be admitted for the purpose of enrolling in advanced course work, only the program faculty may grant permission for the pursuit of a degree. Likewise, a student will not be recommended for a degree until the graduate faculty of a program has indicated in writing that the student has gained the desired knowledge.

Graduate education is an integral part of WVU. The graduate catalog reflects the University's commitment and sets forth the policies and rules for graduate education as they have been determined by the appropriate bodies. It is essential that all students beginning study at the graduate level become familiar with regulations for graduate study in general, as well as with the requirements of their own programs—both of which are detailed in this catalog. Each student should request a graduate catalog when beginning graduate study and become conversant with its contents.

West Virginia University, which is both the comprehensive and land-grant university in the West Virginia system of higher education, offers graduate work leading to 78 master's degrees, 28 doctoral degrees, and one certificate of advanced

study. The graduate programs are administered by 15 schools and colleges of the University and by some interunit committees drawn from two or more of the schools and colleges.

Organization

Assistant

Vice President

for Curriculum

and Instruction

The assistant vice president oversees the policies governing graduate education and monitors the quality of graduate programs. The assistant vice president for curriculum and instruction reports to the provost and vice president for academic affairs and research and works closely with the vice president for health sciences.

Graduate

Council

The University Graduate Council consists of twelve elected representatives from the schools and colleges offering graduate programs and four ex-officio non-voting members representing the provost, the vice president for health sciences, the senate executive committee, and the graduate and professional student association. The council derives its authority from the faculty and from the provost and vice president for academic affairs and research. This body formulates, reviews, and recommends University-wide graduate education policies. The council reviews proposals for new graduate programs, makes major revisions in graduate curricula, coordinates periodic program reviews, establishes the University criteria for graduate faculty membership, and considers such other matters affecting graduate education as are brought to the council by an administrative officer of the University, a graduate faculty member, or a graduate student. The duties of the graduate council include responsibility for programs both on- and off-campus.

Schools and Colleges

Schools and colleges manage most of the day-to-day operation of graduate education. They determine the level of participation by individual faculty members, they specify requirements for programs under their jurisdiction, and they certify students for graduation.

Graduate Faculty

Faculty continue to play the most important role in graduate education. They are responsible for program content, they serve on graduate student committees, and they assure the quality of preparation of the University's graduates.

Regular Membership

Regular members may chair student's committees or direct master's and doctoral research, theses, and dissertations.

• Regular members must hold appointments in tenure track positions.

• Regular members must hold either a terminal degree or have demonstrated equivalent scholarly or creative achievement as defined by their school or college. The definition of equivalent credentials must include, as a minimum, the attainment of the rank of associate professor.

• Regular members must present evidence of continuing scholarly, research, or creative activity.

Schools and colleges set and publish quantitative and qualitative criteria regarding scholarly activity. These criteria are to be applied for the appointment as well as continuation of graduate faculty membership. These initial criteria and any subsequent amendments or changes are subject to approval of the University Graduate Council and should include the following: publication in major peer review journals, publication of books and book chapters,

invited and/or competitively selected presentations of scholarly work at national and international meetings, and/or presentations and performance of artistic work at professionally recognized affairs.

Associate members may perform the same function as regular members with the exception of chairing students' committees or directing master's theses and doctoral dissertations (or equivalent). Associate membership may be used by schools and colleges when the nature of their activities require diverse membership criteria. Because it may not be applicable to all units, it is the prerogative of the schools and colleges to establish and publish their own criteria. These initial criteria and any subsequent amendments or changes are subject to approval of the University Graduate Council and should include one or more of the following requirements: research activity, scholarly publications, artistic performances or presentations, teaching experience, and service on previous committees.

The following individuals must meet the same criteria as other faculty members for review, approval, and continuation as graduate faculty:

- Visiting professors may be appointed as members of the graduate faculty for the term of their appointments.
- Faculty holding non-tenure track appointments may be considered as graduate faculty.
- Emeritus faculty members may remain on the graduate faculty, subject to review.
- Off-campus professionals willing to participate in graduate education may be acceptable as graduate faculty but may not serve as chairperson (exceptions may be approved by the Graduate Council).
- Individuals holding faculty appointments in institutions participating in cooperative doctoral programs may be considered graduate faculty, subject to school or college review.

Normally, no candidate for a degree at WVU may be a regular or associate member of the graduate faculty. Individuals seeking exceptions to this policy must submit a petition to the University Graduate Council.

Individuals interested in appointment to the graduate faculty must request that they be evaluated for initial membership. Associate members interested in reclassification as regular members must initiate a request for evaluation.

Faculty members seeking graduate faculty status must first be evaluated by the school or college in which they hold their primary faculty appointment. If the faculty member holds a secondary appointment in another school or college or for some reason wishes to have graduate faculty status in a second school or college, this is permissible; however, faculty may not be designated a regular graduate faculty member in any school or college if such a status is not held in the primary school or college.

Schools and colleges should establish an appropriate time schedule for evaluating faculty for initial appointment to the graduate faculty and for upgrading graduate faculty status. All graduate faculty must be reviewed annually. The annual review is intended to assist graduate faculty members in gauging their continued progress in scholarship, research, or creative activity. The review process for graduate faculty membership should coincide with the annual

Associate Membership

Exceptions

Degree Candidates

Evaluation

Time Schedule

review process of all faculty. Schools and colleges will determine the appropriate mechanisms by which faculty will be reviewed (School or College Graduate Council, Promotion and Tenure Committee, etc.). The written outcome of this evaluation should be placed in the individual's personnel file.

Continuance

Once every three years, the graduate faculty review of individuals must be accompanied by a decision to continue or discontinue their current level of membership. A faculty member whose graduate faculty membership is discontinued or changed from regular to associate status will be permitted to complete current responsibilities but may only assume additional responsibilities which are consistent with the new status.

Appeals

Appeals regarding graduate faculty membership classification are handled through procedures identified in *Policy Bulletin 36*. **Exception to any of the above must be approved by the University Graduate Council.**

Faculty Pursuing Advanced Degrees

No faculty member holding instructor or professorial rank in a program unit may be admitted to a graduate degree program offered by that unit. Only those ranked teaching fellow, lecturer, etc. can simultaneously pursue a degree in their own unit. A faculty member holding instructor or professorial rank may be admitted to a graduate degree program in another unit.

Nature of Graduate Study

Graduate study at WVU can be compared to a series of contractual arrangements between the student and the graduate faculty. The student's rights, privileges, obligations, and responsibilities are contained in the graduate catalog, the plan of study, and, if research is one of the degree requirements, the prospectus. Although not contracts in the formal legal sense, they are agreements between the University and a student for the accomplishment of planned educational goals.

The *WVU Graduate Catalog* in effect when a student begins work toward an advanced degree constitutes the agreement between the student and West Virginia University. If there are major changes in the catalog during a student's studies, a student, with the approval of the adviser, may agree to meet the conditions of the graduate catalog of a later year. An agreement to change to a later catalog is an agreement to meet all the conditions of the later edition.

Students must abide by catalog changes if the changes were promulgated by the Board of Trustees or local, state, or federal law.

Many programs at WVU require graduate record examination (GRE or GMAT) scores from all applicants, but in no program is an examination the sole criterion for admission. Some programs require both the general and the advanced tests before considering an applicant for admission. Other programs require tests such as the Miller's Analogy. Specific admission requirements are found in the program sections of this catalog.

Students should take the tests required before enrollment in graduate studies. The applicant should request the Educational Testing Service to forward scores to the WVU Office of Admissions and Records.

Applications to take the GRE or GMAT must be mailed to the Educational Testing Service, Princeton, NJ 08540, at least one month before the examination date. The fee for each examination (aptitude and advanced) is \$35 for 1989-90.

GRE and Other Examinations

Information about the Miller's Analogy Test may be obtained from the psychology department or the counseling service of the applicant's undergraduate institution or the WVU Student Counseling Service (293-4431).

Degree Programs

College of Agriculture and Forestry

Degree Program	Bachelor	Master	Doctorate/ Professional
Agricultural Biochemistry		M.S.	
Agricultural Economics		M.S.	
Agricultural Education	B.S.Agr.	M.S.	
Agricultural Microbiology		M.S.	
Agricultural Sciences			Ph.D.
Agriculture		M.Agr.	
Agronomy		M.S.	
Animal and Veterinary Sciences	B.S., B.S.Agr.	M.S.	
Entomology		M.S.	
Family Resources	B.S.Fam.Res.	M.S.	
Forest Resources Management	B.S.F.		
Forest Resources Science			Ph.D.
Forestry		M.S.F.	
Horticulture		M.S.	
Landscape Architecture	B.S.L.A.		
Plant Pathology		M.S.	
Plant and Soil Sciences	B.S.Agr.		
Recreation and Parks Management	B.S.R.	M.S.	
Resource Management	B.S., B.S.Agr.		
Wildlife Management		M.S.	
Wildlife Resources	B.S.		
Wood Industries	B.S.F.		

College of Arts and Sciences

Biology	B.A.	M.S.	Ph.D.
Chemistry	B.A., B.S.	M.S.	Ph.D.
Communication Studies	B.A.	M.A.	
Computer Science	B.S.	M.S.	Ph.D.
Economics	B.A.		
English	B.A.	M.A.	Ph.D.
Foreign Languages	B.A.	M.A.	
Geography	B.A.	M.A.	
Geology	B.A., B.S.	M.S.	Ph.D.
History	B.A.	M.A.	Ph.D.
Interdepartmental Studies	B.A.		
Mathematics	B.A.	M.S.	Ph.D.
Philosophy	B.A.		
Physics	B.A., B.S.	M.S.	Ph.D.
Political Science	B.A.	M.A.	Ph.D.
Psychology	B.A.	M.A.	Ph.D.
Public Administration		M.P.A.	
Sociology and Anthropology	B.A.	M.A.	
Statistics	B.S.	M.S.	

Board of Regents Bachelor of Arts Degree

Board of Regents B.A.

(Intended for older students who wish to resume and complete their college studies. Detailed information available from the Coordinator, Board of Regents B.A. Degree Program, Student Services Center, West Virginia University, Morgantown, WV 26506.)

College of Business and Economics

Accounting B.S.B.Ad.

Business Administration B.S.B.Ad. M.B.A.

Business Management B.S.B.Ad.

Economics B.S. M.A. Ph.D.

Finance B.S.B.Ad.

Industrial Relations M.S.

Marketing B.S.B.Ad.

Professional Accountancy M.P.A.

College of Creative Arts

Art B.A. M.A.

Music B.M. M.M. D.M.A.,
Ph.D.

Theatre B.F.A. M.F.A.

Visual Art B.F.A. M.F.A.

School of Dentistry

Dental Hygiene B.S. M.S.

Dentistry D.D.S.

Endodontics M.S.

Orthodontics M.S.

College of Engineering

Engineering M.S.E. Ph.D.

Aerospace Engineering B.S.A.E. M.S.A.E.

Chemical Engineering B.S.Ch.E. M.S.Ch.E.

Civil Engineering B.S.C.E. M.S.C.E.

Computer Engineering B.S.Cp.E.

Electrical Engineering B.S.E.E. M.S.E.E.

Industrial Engineering B.S.I.E. M.S.I.E.

Mechanical Engineering B.S.M.E. M.S.M.E.

Occupational Health and

Safety Engineering M.S.

Degree Program**Bachelor****Master****Doctorate/
Professional****College of Human Resources and Education**

Education		Ed.D., C.A.S.
Counseling	M.A.	
Education Administration	M.A.	
Educational Psychology	M.A.	
Elementary Education	B.S.E.Ed.	M.A.
Reading	M.A.	
Rehabilitation Counseling	M.S.	
Secondary Education	B.S.S.Ed.	M.A.
Special Education	M.A.	
Speech Pathology and Audiology	B.S.	M.S.
Technology Education	M.A.	

Interdisciplinary Programs

Genetics and Developmental Biology	M.S.	Ph.D.
Liberal Studies	M.A.L.S.	
Reproductive Physiology	M.S.	Ph.D.

Perley Isaac Reed School of Journalism

Journalism	B.S.J.	M.S.J.
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College of Law

Law		J.D.
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School of Medicine

Anatomy	M.S.	Ph.D.
Biochemistry (Medical)	M.S.	Ph.D.
Biomedical Sciences		Ph.D.*
Medical Technology	B.S.	M.S.
Medicine		M.D.
Microbiology (Medical)	M.S.	Ph.D.
Pharmacology and Toxicology	M.S.	Ph.D.
Physical Therapy	B.S.	
Physiology (Medical)	M.S.	Ph.D.

*Awarded under the auspices of the degree-granting authority of WVU, but in cooperation with the Basic Sciences Departments of Marshall University School of Medicine.

College of Mineral and Energy Resources

Engineering of Mines	B.S.E.M.	M.S.E.M.
Mineral and Energy Resources	M.S.	Ph.D.
Mineral Engineering		Ph.D.
Mineral Processing Engineering	B.S.	
Petroleum Engineering	B.S.Pet.E.	M.S.Pet.E.

School of Nursing

Nursing.....B.S.N.....M.S.N.

School of PharmacyPharmaceutical SciencesM.S.Ph.D.
PharmacyB.S.Pharm.**School of Physical Education**EducationEd.D.,
C.A.S.
Community Health EducationM.S.
Physical EducationB.S.P.Ed.M.S.
Sport and Exercise StudiesB.S.P.Ed.
Safety StudiesM.S.**School of Social Work**

Social WorkB.S.W.....M.S.W.

Academic Common Market

West Virginia provides its residents the opportunity, through the Academic Common Market (ACM) and through contract programs, to pursue academic programs not available within the state. Both programs permit West Virginians to enter out-of-state institutions at reduced tuition rates.

Contract programs have been established for study in optometry, podiatry, and veterinary medicine. The ACM provides access to numerous graduate and undergraduate programs. The programs are restricted to West Virginia residents who have been accepted for admission to one of the specific programs at designated out-of-state institutions.

Through reciprocal agreement, WVU allows residents of states within the ACM to enroll in graduate and undergraduate programs on a resident tuition basis.

Further information may be obtained through the Assistant Vice President for Academic Affairs and Research, Stewart Hall, West Virginia University, P.O. Box 6001, Morgantown, WV 26506-6001. Application must be made through the higher education authority of the state of residence. For West Virginia residents, this authority is the University of West Virginia Board of Trustees, 950 Kanawha Boulevard, East, Charleston, WV 25301.

Application

Prospective graduate students are urged to apply for admission as early as possible. The first inquiry from a person interested in a degree program should request information from the department, division, school, or college offering the program. The reply to such an inquiry will include instructions for applying to the particular program.

In all cases, application for admission to graduate study must be made on standard forms provided by the Office of Admissions and Records.

The completed form is returned to the Office of Admissions and Records and must be accompanied by payment of a nonrefundable special service fee. Applicants must at the same time arrange for an official transcript to be sent by the registrar or records office of the college of their baccalaureate degree directly to the Office of Admissions and Records. If other institutions have been attended in the course of undergraduate or graduate study, transcripts should be requested from them as well. No one is admitted to graduate study who does not hold a baccalaureate degree.

If an applicant meets the minimum admission requirements of WVU, a copy of the application is forwarded to the faculty of the program of interest. Any graduate degree program is permitted to set admission requirements beyond the minimum admission standards of the University. No one can pursue an advanced degree at WVU unless admitted to the appropriate degree program. A student who wishes to take additional courses after completing a degree must submit a new application and pay the nonrefundable service fee.

Students not wishing to pursue an advanced degree may apply for admission as non-degree graduate students. Applicants must complete the standard application form, pay the nonrefundable special service fee, state the area of intended study, and present evidence of a baccalaureate degree.

Finally, any applicant who is refused admission may have his or her application reviewed again instead of submitting a new application form and fee. Any applicant who fails to enroll within a year after acceptance must reapply in the regular manner for consideration for a subsequent year.

When students graduate or complete the program for which they applied, they must reapply and be readmitted before taking further course work at WVU. This policy assures that the University is informed of students' objectives and assigns them an appropriate adviser. Students are assessed the application fee for each new application.

Degree students, whether master's or doctoral, are permitted to continue in a program for a maximum of eight years under their original applications. Students who have not been active students for this period of time must reapply and be readmitted. The application fee is assessed.

West Virginia University is authorized under federal law to enroll nonimmigrant foreign nationals as students. International students wishing to enroll for graduate work at WVU must comply with the stated academic requirements for admission and with certain additional academic and nonacademic requirements.

Initial

Fee

Non-degree
Applicants

Second Review

Reapplication

Time

International
Students

International applicants should forward a letter of inquiry one year before they intend to begin study in the United States. The University receives a large number of applications from international students. For this reason and because of the time required for the student to make visa and financial arrangements, April 1 has been established as a deadline after which applications cannot be processed.

International students should make all arrangements for their financial obligations to WVU for their entire stay in the United States before leaving their country.

English Proficiency

All international applicants whose native language is not English must submit Test of English As a Foreign Language (TOEFL) scores. A minimum score of 550 is required for admission. TOEFL information and registration forms are available from the Educational Testing Service, Princeton, NJ 08540 USA. Tests are normally given six times each year and require six weeks to score, with scores reported to the individual. Registration for the TOEFL examination closes five weeks before the testing date.

NOTE: In certain programs, provisional admission is possible for students with scores lower than 550 on the TOEFL. In such cases, students are admitted provisionally on the basis of their academic record, contingent upon submission of satisfactory TOEFL scores or satisfactory completion of the WVU Intensive English Program. For information about the Intensive English Program, contact the WVU Intensive English Program, Centennial House, Stewart Street, Morgantown, WV 26506.

Credentials

Complete and original official records of all studies undertaken by an applicant at any institution attended (secondary school, college, university, technical school, professional school, etc.), must be provided at the time of application for admission to WVU. Copies of original records of studies completed outside of the United States are acceptable if they are officially stamped.

Such records must include:

- Complete dates of attendance;
- Identification of individual subjects;
- Total number of hours in each class per week;
- Total number of weeks each class meets in session;
- Final grade in each subject, for each session;
- Actual credits earned for each subject;
- Class, division, or rank achieved;
- Biographical information;
- Explanation of each institution's grading system; and
- Certification and date of degree or awards achieved.

If any of this information cannot be supplied, an official explanatory statement from the school should be submitted. All documents must be accompanied by certified English translations.

All documents must be forwarded directly from the registrar or other authorized official of the school to the WVU Office of Admissions and Records, P.O. Box 6009, Morgantown, WV 26506-6009 USA.

If an applicant is currently enrolled in a school, tentative admission may be granted on the basis of an incomplete record which indicates the applicant will unquestionably meet the admission

standards of WVU. Final admission, however, cannot be approved until the complete record has been received and evaluated.

International students applying to transfer from schools within the United States are not permitted to register at WVU until they have complied with all transfer procedures as required by the United States Immigration and Naturalization Service (INS).

Upon arrival on the campus, the student must be prepared to present the I-20 or IAP 66 to the international student adviser for formal processing.

No student should move to Morgantown without having received an assurance of admission and immigration documents from WVU.

A student wishing to transfer to WVU from another institution should follow the same application procedures as those outlined for other new students.

A student wishing to apply credit earned at another institution of higher education to a master's degree at WVU must obtain a transfer of graduate credit form from the Office of Admissions and Records. This form requires the signature of the student's unit chairperson or designee. The student must also have an official transcript from the other institution sent to the Office of Admissions and Records. Only credit earned at institutions accredited at the graduate level may be transferred. Non-degree graduate students are not permitted to transfer credit to WVU from another institution.

A maximum of 12 semester hours from other institutions may be transferred for credit at WVU in master's degree programs requiring 30 to 41 semester hours. Eighteen semester hours can be accepted for master's degree programs requiring 42 or more semester hours. Individual graduate programs may accept fewer credit hours.

Permission forms to apply for transfer credit must be obtained from and returned to the Office of Admissions and Records. Only credit earned at institutions accredited at the graduate level may be transferred. It is strongly recommended that students have transfer credit approved prior to enrolling in course work.

University policy permits students to obtain more than one master's degree. In these cases, a separate application is required for each program. Each application must be accompanied by payment of a nonrefundable special service fee.

If a student seeks more than two master's degrees, the student must petition the Office of the Assistant Vice President for Curriculum and Instruction for permission to apply. The petition must state the student's objectives for obtaining another master's degree and must be in writing. The purpose of the petition is to assure that the student receives appropriate academic counseling.

A student desiring to obtain more than one master's degree must successfully complete sufficient additional credit hours to constitute 75 percent of the credit hours required by the additional master's degree program. An individual graduate unit may require a higher percentage of credit to be earned under its direction.

Inactive students who wish to become active should report to the Office of Admissions and Records and complete the required forms to update their University records and pay the program reactivation fee. Degree students who have been inactive for eight or more years are not eligible to reactivate, but must reapply for admission.

International Students Transferring Within the U.S.

Transfer From Another Institution to WVU

Credit From Another Institution

Concurrent or Additional Master's Degree

Reactivation Application

Admission to Graduate Study

Classification—

Regular

Regular graduate students are degree-seeking students who meet all the criteria for regular admission to a program of their choice. The student must possess a baccalaureate degree from a college or university, must have at least a grade-point average of 2.5 (on a 4.0 scale), have met all the criteria established by the degree program, and be under no requirements to make up deficiencies.

Provisional

A student may be admitted as provisional by any unit when the student possesses a baccalaureate degree but clearly does not meet the criteria for regular admission. The student may have incomplete credentials, deficiencies to make up, or may have an undergraduate scholastic record which shows promise, but less than the 2.5 grade-point average required for regular admission.

Non-Degree

A non-degree student is a student not admitted to a program. Admission as a non-degree student does not guarantee admission to any course or program. The reasons for non-admission may be late application, incomplete credentials, scholarship deficiencies, or lack of a degree objective. Even though a non-degree student has not been admitted to a graduate program, a unit may allow a non-degree student to enroll in its courses. To be admitted as a non-degree student, a student must only present evidence of a baccalaureate degree, but the student must obtain a 2.25 grade-point average on the first 12 credit hours of course work and maintain this average as long as enrolled. To be eligible to enter a degree program, the student must maintain a minimum of a 2.75 grade-point average on all course work taken since admission as a graduate student.

The standards cited are the minimum standards established by the University. Individual academic units or graduate programs may establish higher standards.

Classification Based on Prior Graduate Study

The same three admission classifications apply to those who have undertaken previous graduate study. In general, the cumulative grade-point average regulations apply to any transfer student who has not completed a graduate degree. However, an applicant having received a master's degree from an accredited college or university may be admitted to whatever category is deemed most appropriate by the faculty of the program of interest.

Reclassification— Provisional to Regular

The provisions of a student's provisional status must be specified in the letter of admission. To be reclassified as a regular student, a student must meet the provisions stated in the letter of admission and achieve a minimum grade-point average of 2.75 on all course work taken during the provisional period. Individual degree programs may set higher grade-point average requirements.

No later than the completion of the 18th credit hour, a unit must review the student's record and make a final decision on the student's admission. A student who has met the provisions of admission and achieved the required grade-point average will be reclassified as a regular student. A student who fails to meet the provisions of admission or who fails to achieve the required grade-point average will be suspended, but may be reinstated in order to transfer to another program or to non-degree status. The academic unit must

notify the student and the Office of Admissions and Records of its decision.

Upon notification by the appropriate academic unit, the Office of Admissions and Records will prohibit the registration of all provisional graduate students who have reached the maximum of 18 credit hours. Registration will not be permitted until the student is reclassified as a regular student, an exception is granted by an academic dean, or the student is transferred.

A student may be admitted as a provisional graduate student more than one time, but not by the same graduate program.

All credit hours taken since admission as a provisional graduate student or to be applied to a degree count in the 18 credit-hour limit, i.e., undergraduate or graduate credit, P/F, S/U, graded courses, credit by senior petition, and transfer credit.

Regular and provisional students may become non-degree students by choice. This includes students who fail to meet admission or academic standards or who withdraw voluntarily. To change a student to non-degree status, the adviser must process a Graduate Studies Transfer/Status form through the school or college dean's office.

Non-degree students who later wish to become degree students must transfer and present all the credentials required by the degree program. This requires the processing of a Graduate Studies Transfer/Status form by the student's adviser through the Office of Admissions and Records.

For admission to a degree program, a non-degree student must have achieved a minimum grade-point average of 2.75 on all course work taken since admission as a graduate student.

Transfer Procedures

A student may initiate a transfer by contacting the dean's office of the school or college where enrolled. Following the student's request, the dean's office will send the student's record to the school or college that the student wishes to enter.

The school or college receiving the record is required to acknowledge receipt of the record and notify the Office of Admissions and Records of the status of the student's application within 30 days. If a student is accepted by the new school or college, the school or college retains the student's record and notifies the student of acceptance. If a student is rejected, he or she is notified of such action, and the student's record is returned to the original school or college.

The Office of Admissions and Records is responsible for updating students' records to reflect new majors and new advisers.

When a student transfers from one unit or program to another unit or program within the University, the faculty of the new unit determines if any credit earned under the guidance of the prior unit may be applied to a degree, certificate, or other educational offering of the new unit.

Programs may establish admission requirements in addition to those set by the University Graduate Council, such as a higher grade-point average, the submission of scores on standardized tests, and the receipt of letters of recommendation.

**Regular or
Provisional
to Non-Degree**

**Non-degree
to Regular
or Provisional**

**Intra-University
Transfers**

**Intra-University
Transfer Credit**

**Special
Admission
Requirements**

Special Additional Requirements and Information

College of Agriculture and Forestry

Graduate Admission Classification (Minimum Requirements)

Regular: A regular graduate student is a degree-seeking student who meets all the criteria for regular admission to a program of his/her choice. The student must possess a baccalaureate degree from a college or university, must have at least a grade-point average of 2.75 on a 4.0 scale (or an average of 3.0 or higher for the last 60 credit hours), have met all the criteria established by the degree program, and be under no requirements to make up deficiencies.

The student must:

1. Have an adequate academic aptitude at the graduate level as measured by the Graduate Record Examination (GRE), or the New Medical College Admissions Test (New MCAT).
2. Provide three letters of reference from persons acquainted with the applicant's professional work, experience, or academic background.
3. Submit a written statement of 500 words or more indicating the applicant's goals and objectives relative to receiving a graduate degree.
4. International students have the additional requirement to submit a minimum score of 550 on the TOEFL examination if their native language is not English.

See specific graduate programs in the College of Agriculture and Forestry for additional requirements.

Provisional: A student may be admitted as provisional when the student possesses a baccalaureate degree but clearly does not meet the criteria for regular admission. The student may have incomplete credentials, deficiencies to make up, or may have a promising undergraduate scholastic record that is less than the 2.75 grade-point average or an average of 3.0 or higher in the last 60 credit hours required for regular admission.

Non-Degree: A non-degree student is a student not admitted to a program. Admission as a non-degree student does not guarantee admission to any course or program. The reasons for non-admission may be late application, incomplete credentials, scholarship deficiencies, or lack of a degree objective. Even though a non-degree student has not been admitted to a graduate program, an academic unit may allow a non-degree student admission. A student must present evidence of a baccalaureate degree and obtain a 2.5 grade-point average on the first 12 credit hours of course work and maintain this average as long as enrolled. A maximum of 12 credit hours of work as a non-degree student may be applied to a graduate degree if the student is later accepted into a graduate program. To be eligible to enter a degree program, the student must maintain a minimum of a 3.0 grade-point average on all course work taken since admission as a graduate student.

College of Business and Economics

Admission requirements for the MBA, MPA, and MSILR programs include a grade-point average of 3.0 (either overall or in the last 60 credit-hours) and a GMAT score of at least 500. In the industrial relations (M.S.) program, only an acceptable GRE score may be substituted for the GMAT. Admission to the M.A. in economics requires a prior grade-point average of at least 2.75 and a GRE score of 1500.

College of Creative Arts

The College of Creative Arts offers graduate programs leading to terminal degrees in art, music, and theatre. All students apply for admission through the University's Office of Admissions and Records. All candidates for graduate degrees must conform to University regulations for graduate study. Requirements for admission to specific

programs are included in the program descriptions. Most programs require an audition or a portfolio review as a part of the admission process.

Graduate Assistantships

Full graduate assistants receive a stipend and are eligible to apply for remission of fees. Approximately 11 graduate assistantships in art, 14 in theatre, and 24 in music are available each year. Application for these assistantships should be made to each division, the application deadline for art is April 1, for music March 1, and for theatre April 1.

School of Dentistry

The School of Dentistry offers several advanced education programs. The Departments of Dental Hygiene, Endodontics, and Orthodontics offer programs of advanced study leading to the degree of master of science. Detailed information concerning the M.S. programs in dental hygiene, endodontics, and orthodontics is found in the individual program listings.

The Department of Oral and Maxillofacial Surgery offers one four-year residency. Seven one-year general practice residencies also are offered by the School of Dentistry. Continuing education courses are offered throughout the year. Information concerning admission requirements and courses of study in the M.S. programs may be obtained from the Office of the Associate Dean for Postdoctoral Programs, WVU School of Dentistry, Morgantown, WV 26506.

College of Engineering

A student desiring to take courses for graduate credit in the College of Engineering must comply with the appropriate University regulations for graduate study. To become enrolled in a College of Engineering graduate program, a student must apply for admission through the Office of Admissions and Records to the major department of the student's choice. Acceptance by the major department will depend upon review of the student's academic background and available facilities in the department.

An applicant with a baccalaureate degree, or its equivalent, from an institution accredited by the Accreditation Board for Engineering and Technology (ABET) or from an internationally recognized program in engineering will be admitted on the same basis as engineering graduates of WVU. Lacking these qualifications, an applicant must first fulfill any special requirements of the department in which the student is seeking an advanced degree.

No credits which are reported with a grade lower than C are acceptable toward an advanced degree.

To qualify for an advanced degree, the graduate student must have a grade-point average of at least 3.0 based on all courses acceptable for graduate credit for which the student has received a grade from WVU.

A graduate student in the College of Engineering must comply with the regulations of the major department.

Master of Science (M.S.)

Each department in the College of Engineering offers designated M.S. degrees and the College of Engineering has an undesignated degree, Master of Science in Engineering (M.S.E.), as well as a Master of Science (M.S.) in occupational and safety engineering administered by the Department of Industrial Engineering. For all M.S. degree students, an advisory and examining committee consisting of at least three faculty members will be appointed. Each candidate will, with the approval of the candidate's advisory and examining committee, follow a planned program which must contain a minimum of 30 semester credit hours, not more than nine of which can be at

the 200 level. If a thesis or a problem report is part of the candidate's program, not more than six semester credit hours of research leading to an acceptable thesis nor more than three semester credit hours of work for an acceptable problem report may be applied toward the semester credit hour requirement.

Individual departments may establish minimum requirements greater than those adopted for the College of Engineering as a whole. These departmental requirements are contained in the program section of the graduate catalog.

A student wishing to apply graduate credit earned at another institution to a master's degree at WVU must complete an "Application for Transfer of Graduate Credit to WVU" form and have an official transcript submitted to the WVU Office of Admissions and Records from the external institution. A maximum of 12 semester hours from other institutions will be acceptable for credit at WVU in master's degree programs requiring 30 to 41 semester hours. Eighteen semester hours will be accepted for master's degree programs requiring 42 or more semester hours. Departmental programs may choose to accept fewer transfer credit hours.

The Master of Science in Engineering program is designed for students with a baccalaureate degree in a technical area who desire to pursue work in areas other than that of their baccalaureate degree in engineering or science. Graduate students who wish to become candidates for the degree should register with the department in which the major portion of the work is to be done.

A plan of study must be jointly prepared and approved by the student and all members of the student's Advisory and Examining Committee, the department chair, and the dean or dean's designate, either at the end of the second semester of the student's attendance or at the completion of the twelfth course hour, whichever is later.

Doctor of Philosophy (Ph.D.)

The academic units within the College of Engineering that are approved for participation in the Doctor of Philosophy (Ph.D.) program are: Chemical Engineering, Civil Engineering, Electrical and Computer Engineering, Industrial Engineering, and Mechanical and Aerospace Engineering.

Admission. Admission as a graduate student is required of all applicants for admission to a program of study and research leading to the Ph.D. degree. Applicants for admission must hold or expect to receive a bachelor's degree in engineering from an accredited or an internationally recognized program in engineering. An applicant who holds a B.S. or M.S. in one of the physical sciences or mathematics may be considered for admission. Although a bachelor's degree is the minimum requirement, a master's degree in engineering is recommended for applicants. Admission to graduate study does not necessarily assure entrance into the College of Engineering doctoral program.

Transfer Credits. A student wishing to apply credit earned at another institution to a doctoral degree program at WVU must submit the Application For Transfer of Graduate Credit to WVU form and have an official transcript from the institution forwarded to the WVU Office of Admissions and Records. The approval of transfer credit is at the discretion of the student's advisory and examining committee.

Advisory and Examining Committee. The student, research adviser, academic adviser, and department chairperson appoint the student's advisory and examining committee. For the Ph.D. program, each committee contains at least five members. Three members must be from the student's major department and two from other disciplines related to the student's area of interest.

Plan of Study. At the end of the second semester of a student's attendance or at the completion of the twelfth hour or when master's degree requirements are completed, whichever is later, the student, with the advice and consent of the student's academic adviser, research director, and members of the student's advisory and examining

committee, will submit a plan of study, initiated in the student's department, to the dean or dean's designee. Some departments may require that a preliminary dissertation research proposal be submitted at this time.

Candidacy. After admission to the program and after a period of residence, the applicant takes a candidacy examination in which the student must demonstrate: (a) a grasp of the important phases and problems of the field of study and an appreciation of their relation to other fields of human knowledge and accomplishments; and (b) the ability to employ rationally the instruments of research developed in the student's area of interest. When an applicant has passed the comprehensive examination, the student will be formally admitted to candidacy for the doctoral degree. One opportunity for reexamination is available.

Curriculum. The Doctor of Philosophy degree is not awarded by the mere accumulation of course credits nor for the completion of a definite residence requirement. The amount and nature of the course work undertaken will be established for each individual student with the objective of insuring a rational and coherent progression of academic development beyond the baccalaureate degree.

Residency. Two semesters of full-time attendance at the WVU Morgantown campus are required, consisting of a minimum of nine credit hours each. A full summer schedule, consisting of registration in both sessions and completion of a minimum of nine total hours, is considered equivalent to a one-semester residence.

Dissertation. The candidate must submit a dissertation on a topic within the area of his/her major interest. The doctoral dissertation must represent the results of independent research, show a high degree of originality and creativity on the part of the student, and must constitute an original contribution to the field of engineering science and/or design. The dissertation must have good literary form and style and must present a thorough review and survey of prior study and work in the area of research, with acceptable standards of documentation. It is anticipated that the work leading to the completion of the dissertation will require a minimum of 24 hours of research credits, or satisfactory evidence of equivalent time devoted to research and preparation of the dissertation.

Completion Time. Requirements for this degree must be completed within five years after admission to candidacy.

Final Examination. Upon completion and approval of the dissertation and fulfillment of all other requirements, the candidate must pass a final oral examination conducted by the Advisory and Examining Committee. The examination will be primarily a defense of the dissertation, although other questions necessary to determine the candidate's logic, critical ability, and reasoning power in the general field of study related to the research may be asked in order to establish the qualifications of the candidate for the degree.

College of Human Resources and Education

The College of Human Resources and Education offers graduate programs in the areas of counseling, counseling psychology, education administration, elementary education, educational psychology, reading, secondary education, rehabilitation counseling, special education, speech pathology and audiology, and technology education. The college brings together several disciplines devoted to the study and maximum development of human talent and resources, whether in the context of the school, the family, or the community. Programs of instruction, research, and extended service are carried out in close cooperation with other related departments and divisions of WVU.

Admission and Curricula

The College of Human Resources and Education and the West Virginia Department of Education are in the process of reviewing and revising all certification programs. Students are warned that programs printed in the catalog may not be in effect at the time of their registration and are advised to see their adviser upon arrival on campus.

All students apply for admission to graduate study through the Office of Admissions and Records. All candidates for degrees must conform to the general University graduate study regulations, specific requirements of the College of Human Resources and Education, and specific requirements of the program area in which they are pursuing graduate studies. Details regarding admission to specific graduate programs of the College of Human Resources and Education are provided within the program section of this catalog. Students may obtain additional information about a particular graduate program by writing to the coordinator of that program or by writing the Dean, College of Human Resources and Education, West Virginia University, P.O. Box 6122, Morgantown, WV 26506-6122.

Certification Requirements

The curriculum and degree requirements of the various degree programs of the College of Human Resources and Education are provided in each program section in this catalog. It is the responsibility of the student to take steps to insure that he or she is properly informed of the degree requirements and/or the certification standards being sought. Since certification requirements are changed from time by the state, the fulfillment of certification requirements as presented in this catalog can not guarantee compliance with current requirements. Students are therefore encouraged to seek the counsel of members of the faculty, their advisers, and the college certification officer on matters pertaining to degree and certification requirements.

Doctor of Education (Ed.D.)

The program for the degree of doctor of education (Ed.D.) is competency-based and requires that the candidate demonstrate an ability to conduct research. The student's committee chair, the student's committee, and the student consult to determine the competencies the student must attain and how the student is to be evaluated in accordance with program, college, and University requirements. Faculty expertise and College of Human Resources and Education support services are available for students desiring to elect an area of emphasis in any of the following: counseling psychology and rehabilitation, curriculum and instruction (including reading), education administration, educational psychology, special education, and technology education. Further information about the specific design of a doctoral program in the above emphasis areas may be listed in the program section of the catalog and is available from the department chair.

Admission. Individuals who wish to pursue a program leading to the doctor of education degree must be admitted to the specific doctoral program at West Virginia University as doctoral students. All applicants for admission to the doctoral program in the College of Human Resources and Education must submit their scores on the aptitude test of the Graduate Record Examination and/or the Miller Analogy Test, three letters of recommendation, a current vita, a statement of long-range and short-range goals, and their reasons for selecting WVU as the institution for matriculation. Applicants to HRE must comply with the general University graduate study regulations. Personal interviews are required by several programs. Additional

information may be required by the faculty of a division and/or a specific area of emphasis prior to program admission.

Doctoral Committee. After admission to a specific program, the student, in consultation with the adviser, selects a chairperson and four committee members to serve as his or her doctoral committee. This committee must be approved by the department chair, the division director, and the dean of the college. The doctoral committee must meet the following minimum standards:

1. The doctoral committee must be composed of a minimum of five members, at least three of whom must be regular members of the graduate faculty.
2. The student's major adviser must be from the student's major program area and must be a regular member of the graduate faculty. No more than two other members of the doctoral committee may be from the student's major program area of study.
3. At least two members of the doctoral committee must be from the student's major program area of study.
4. At least one member of the doctoral committee must be from the student's minor program area of study.
5. The doctoral committee must include at least one member from outside the student's program area, and that individual must have knowledge and insights relevant to the student's program of study.
6. No more than one member of the doctoral committee may be a non-member of the graduate faculty.
7. At least three members of the doctoral committee must be members of the graduate faculty of the College of Human Resources and Education.

Curriculum. The final determination of the program of course work and research is the responsibility of the student's doctoral committee. The doctor of education degree is not awarded on the basis of the completion of any set number of credits, but is awarded on the basis of demonstrated academic achievement and scholarly competence. Seventy-two semester hours of relevant graduate work, excluding dissertation credit but including credits of relevant graduate work completed at the master's degree level, constitutes the minimum course work acceptable. The doctoral program must include course work in three areas: major, minor, and foundations, and the division and program requirements in each area must be met.

Admission to Candidacy Examination. The purposes of the admission to candidacy examination are to assess the quality of the student's academic achievement, to review the student's program of course work, to approve a proposed outline of dissertation research, and to admit the student to formal candidacy for the doctoral degree.

The student and the committee at the time of program planning will identify competencies to be developed and the method of their assessment. These will be stated in the student's individual program. The doctoral student and his or her permanent committee will determine when the student is ready for assessment of competencies.

The examination will be prepared and assessed by the student's doctoral committee and will address all work in the written doctoral program of the student. The chairperson will notify the student and the student records office, who will notify all appropriate University and college offices of the outcome. Upon successful completion of the admission to candidacy examination, and the acceptance by the committee of the dissertation prospectus, the student will be admitted to formal candidacy for the doctoral degree.

Dissertation. The candidate must submit and justify a prospectus for a doctoral dissertation as a portion of the admission to candidacy examination. The doctoral committee must review and approve, approve with change, or reject the outline or prospectus. The student must consult with all members of the doctoral committee and with other appropriate members of the University faculty during the dissertation phase of the program.

Final Oral Examination. The student will be admitted to final oral examination upon completion of the dissertation and after fulfilling all other requirements set by the committee. The examination will be conducted by the student's doctoral committee and the publicized meeting will be open to all members of the University faculty. If the student receives more than one unfavorable vote from the doctoral committee, the candidate will not be recommended for the doctoral degree.

Time Limitation. If the student should fail to complete an approved dissertation within five years after being admitted to candidacy, he or she must repeat the admission to candidacy examination and any other requirements specified by the student's doctoral committee.

Residency. A student must satisfactorily complete a minimum of nine semester hours of approved graduate credit in each of two consecutive terms.

Certificate of Advanced Study (C.A.S.)

The certificate of advanced study program is designed for school and related personnel who seek professional training beyond the master's degree. Candidates for the certificate of advanced study in education may choose from among the following areas of study for their area(s) of concentration:

- Counseling psychology and rehabilitation;
- Education administration;
- Elementary education;
- Reading;
- Secondary education;
- Special education;
- Technology education.

Persons interested in the certificate should consult with the coordinator of the appropriate program or the Dean of the College of Human Resources and Education.

Admission. Individuals who wish to pursue a program leading to the certificate must be admitted as WVU graduate students. All applicants for admission to the program in the College of Human Resources and Education must submit scores on the aptitude test of the Graduate Record Examination and/or the Miller Analogy Test and three letters of recommendation. In addition, they must comply with the general University graduate study regulations. Acceptance for study toward the certificate in a specific area of concentration will be made by the faculty of the specific program and division.

Requirements for Admission to Candidacy. Evidence through examination and personal interview of general proficiency and acceptable standards of oral and written communication is required.

Program. An approved program consists of a minimum of 30 semester hours earned above the master's degree including 24 hours of course work in the College of Human Resources and Education, or in closely related fields, and six hours of research.

At least 24 semester hours of the work credited for this certificate must be done in residence at WVU. This includes the six hours of research, which may be conducted apart from the physical limits of the University but which must be done under the direction and supervision of the chairperson of the student's graduate committee. A maximum of six semester hours earned in residence at another approved graduate institution may, if approved by the student's adviser, be allowed toward credit for the certificate. The minimum period of full-time graduate study in residence at WVU is one semester or one full summer session.

Final Examination(s). Upon satisfactory completion of all requirements, including the research report, the candidate will be admitted to a final oral examination by the student's graduate committee.

Time Limitation. All requirements must be completed within the eight years immediately preceding the awarding of the certificate.

Master of Arts (M.A.); Master of Science (M.S.)

The master of arts degree is offered in those areas which lend themselves to a broader based education; generally a wider choice of electives is offered. Programs leading to the master of arts degree are offered in counseling, education administration, educational psychology, elementary education, reading, secondary education, special education, and technology education.

The master of science degree is offered in those areas which are more specialized and in which areas of electives are specified. Programs leading to the master of science degree are offered in rehabilitation counseling and speech pathology and audiology.

Various areas of emphasis are available under several of the degree programs listed above, and students should contact the specific program for information.

Admission Requirements

Applicants should apply to the WVU Office of Admissions and Records for admission to graduate study. (P.O. Box 6009, Morgantown, WV 26506-6009.) All applicants must comply with the general admission requirements for University graduate study, the requirements of the College of Human Resources and Education, and the requirements of the specific program of interest.

All graduate students are admitted in one of the three University classifications and are responsible for making a formal request for change of status.

Regular A regular graduate student is a degree-seeking student who meets all the criteria for regular admission to a program of his/her choice. The student must possess a baccalaureate degree from a college or university, must have at least a grade-point average of 2.5 (on a 4.0 scale), have met all the criteria established by the degree program, and be under no requirements to make up deficiencies.

Provisional A student may be admitted as provisional by any unit when the student possesses a baccalaureate degree but clearly does not meet the criteria for regular admission. The student may have incomplete credentials, deficiencies to make up, or an undergraduate scholastic record which shows promise but less than the 2.5 grade-point average required for regular admission. The student is responsible for formally requesting a change of status when the requirements are met.

Non-Degree A non-degree student is one who is not admitted to a program. Admission as a non-degree student does not guarantee admission to any course or program. The reasons for non-admission may be any of those described in earlier catalogs for special students, such as late application, incomplete credentials, scholarship deficiencies, or lack of a degree objective. Even though a non-degree student has not been admitted to a graduate program, a unit may allow a non-degree student to enroll in its courses. The student is responsible to request a change of degree status through the adviser.

Optional Routes

Three options are generally available in HR&E programs; the student should refer to the specific program to determine which option applies.

A. At least 30 semester hours of course work, including six semester hours of research.

B. At least 30 semester hours of course work, including three semester hours of research, selected in conference with the candidate's committee, directed by the adviser, with final approval by the committee, and 27 semester hours of course work.

C. At least 36 semester hours of approved course work.

Program Requirements

1. **Guidelines**—The student must comply with specific graduate requirements of the University, the College of Human Resources and Education, and the program.
2. **Advising**—All students will be assigned an adviser. Two additional faculty members will be assigned to serve as the remainder of the three-member master's committee.
3. **Grade-Point Average**—No student may be awarded a master's degree unless the student has a minimum grade-point average of 3.0 on all work taken for the graduate degree. (A grade of less than C does not carry credit toward a graduate degree, but counts in determining the grade-point average.)
4. **Course Repeats**—No student will be permitted to repeat a required graduate course more than once.
5. **Transfer Credit**—A maximum of 12 graduate credit hours may be used as transfer credit for a program with 30-41 hours. Credit for transfer must be of graduate level from an accredited college or university offering a graduate degree. Only credit of B or higher will be transferred.
6. **Comprehensive Examination**—Many programs require the comprehensive examination in options A, B, and C above. The candidate's committee will determine whether the examination will be oral, written, or both. Within the first two weeks of the semester in which the student intends to take the final master's degree examination, he or she must submit to the appropriate department chair an application to take the examination. A student must have completed a minimum of 27 semester hours of approved course work before taking the comprehensive examination. In addition, a student must have achieved a 3.0 grade-point average of all work taken for graduate credit before applying to take the comprehensive examination.
7. **Time Limitation**—All requirements must be completed within eight years immediately preceding the awarding of the degree.
8. **Program Termination**—Students who fail to meet the specific requirements of the sections dealing with admission, grade-point average, course repeats, transfer credits, comprehensive examinations, or special written requirements specified by the program will not be admitted to or will be terminated from the degree program. Students not admitted to or terminated from a degree program may apply in writing for classification as a non-degree graduate student to the appropriate department chair or the Office of Student Advising and Records of the College of Human Resources and Education, P.O. Box 6122, Morgantown, WV 26506-6122. This would allow the student to take course work for certificate renewal, certification, or personal interest, but which is not applicable for a degree in the program.

Enrollment and Registration

Credit toward a graduate degree may be obtained only for courses listed in the graduate catalog and numbered 200-499. No more than 40 percent of course credits counted toward meeting requirements of any graduate degree may be at the 200 level. No residence credit is allowed for special field assignments or other work taken off the WVU campus without prior approval.

Credit Limitations

Graduate credit is obtained only for courses in which the grade earned is A, B, C, or S. No course in which the grade earned is D, P, F, or U can be counted toward a graduate degree.

Graduate students are required by their advisers to limit their credit loads in proportion to the outside service rendered and the time available for graduate study. In general, persons in full-time service to the University or other employer are advised to enroll for no more than six hours of work in any one semester; those in half-time service are advised to enroll for no more than 12 hours. Recommended credit loads may be less for employed graduate students in some academic colleges, schools, and departments.

Employment

It is recommended that a student enroll for no more than 15 hours of graduate courses in any one semester and no more than 12 hours in the total of the two summer enrollment periods. Credit overloads may be approved for students by their advisers. Some dean's offices may choose to monitor overloads in their academic units.

Credit Overloads

All requirements for a master's degree must be completed within eight years preceding the student's graduation. In exceptional circumstances, provisions for revalidation of courses taken more than eight years prior to graduation may be made by the dean of the college in which the courses were taken. Individual programs may set shorter time limits for completion of degree requirements. Students who have not been active for this period of time are deleted from active status and must reactivate their records and pay the reactivation fee. Once inactive, students may not register for classes until this fee is paid. Degree students, either master's or doctoral, are permitted to continue in a program for a maximum of eight years under their original application. Students who have not been active for this period of time must reapply and be readmitted. The application fee is assessed.

Time Limits

The University must have current information (name, address, telephone number, major, and adviser) about students enrolling for classes in order to communicate with students and maintain permanent records. In addition, when individuals do not enroll in classes for substantial periods of time, it is costly and time consuming to continue to maintain their records on active status. For these reasons, the Office of Admissions and Records periodically deletes degree and non-degree student records from active status. Students who return after this deletion must reactivate their records and pay the program reactivation fee.

Active/Inactive Status

The doctorate is a research or performance degree and does not depend on the accumulation of credit hours. The three requirements of the degree are admission to candidacy, residency, and completion and defense of a dissertation. The degree signifies that the holder has the competence to function independently at the highest level of endeavor in the chosen profession. Hence, the number of years

Doctoral Degrees

involved in attaining or retaining competency cannot be readily specified. Rather, it is important that the doctoral student's competency be assessed and verified in a reasonable period of time prior to conferral of the degree.

Candidacy Examination

The qualifying or candidacy examination assesses whether the student has attained sufficient knowledge of the discipline and supporting fields in order to undertake independent research or practice. The examination generally occurs after all course work has been completed and language or other requirements are satisfied, and it consists of a series of examinations covering all areas specified in the plan of study. After the component parts of the qualifying examination have been successfully passed, the student is admitted to candidacy for the degree. No one can be called a doctoral candidate until this first requirement for the degree has been met.

Because the qualifying examination attests to the academic competence of the student who is about to become an independent researcher or practitioner, the examination can not precede the degree by too long a period of time. Consequently, doctoral candidates are allowed no more than five years in which to complete remaining degree requirements. In the event a student fails to complete the doctorate within five years after admission to candidacy, an extension of time can be obtained only by repeating the qualifying examination, and meeting any other requirements specified by the student's committee.

Advising

Each academic unit through which graduate degree programs are administered has one or more graduate advisers, and every graduate student is assigned an adviser at the time of admission or shortly thereafter. The adviser and student should meet before the first enrollment to begin formulation of a plan of study.

Plan of Study

Shortly after entrance into a degree program and usually before nine to twelve hours of graduate course work have been completed, a meeting is held among student, adviser, and committee (if appointed) to draw up a plan of study. Depending on the degree sought and the field of study, the plan may also contain an outline of the research problem to be undertaken. Some graduate programs have the student and committee meet at a later date to delineate the research project more formally as a prospectus for the report, thesis, or dissertation.

The plan of study is subject to approval and is made a part of the student's record. It then becomes a formal agreement between student and program faculty as to the conditions which must be met for completion of the degree requirements. Any subsequent changes in the plan of study (or prospectus) can be made only through mutual agreement.

When the binding nature of these documents is fully understood, there is less likelihood that later misunderstanding will arise. Thus anyone who contemplates application for graduate work at WVU is urged to read the graduate catalog carefully and request clarification where needed. A student must be very aware of the right to express personal views in the drafting of the plan of study and/or research prospectus. Should disagreement arise at any time, the responsibility for arbitration rests with the dean of the school or college.

Schedule of Courses

Before the opening of semesters and summer sessions, a printed *Schedule of Courses* announces the course offerings by the colleges

and schools of WVU. Copies are available from the Office of Admissions and Records.

Deans' offices maintain all records for monitoring student progress and for certifying students for graduation. Among these records are plans of study (subject to the school or college dean's approval), graduate committees (subject to the school or college dean's approval), grades, grade modifications, etc.

If a graduate student is using University libraries or research facilities or consulting with graduate committee members, it is necessary for the student to enroll for at least one hour of graduate credit. **In no other way can the University receive credit for its contribution to graduate study, attest to student status, and guarantee the protection to which the student is entitled.** Students who take courses intermittently may be excused from such continuous enrollment if they are not using University facilities or consulting with faculty while they are not enrolled. **However, students formally admitted to candidacy for graduate degrees are required to register for at least one credit hour each semester as a condition of their continued candidacy.** By pursuing a degree at this institution, such persons by definition are utilizing University services, facilities, and other resources, including faculty expertise; this situation continues in cases where students have completed all required course work and are working on a thesis or dissertation. Candidates for graduate degrees who fail to maintain continuity of enrollment can be dropped from candidacy.

West Virginia University operates five graduate centers located at Jackson's Mill, Parkersburg, Keyser, Shepherdstown, and West Liberty. Approximately 200 graduate courses are offered each semester at these centers.

Students wishing to take off-campus courses for graduate credit must first be admitted as graduate students through the same procedure as for on-campus study. It is the responsibility of students to ascertain from the appropriate college, school, and department the specific requirements for degree candidacy.

Selected master's programs are offered at all five of the centers, including education administration, elementary education, secondary education, special education, and communication studies. Other master's degrees are offered at one or more graduate centers, including business administration and counseling. Courses in these and other fields meet public education certification requirements as well as personal and professional development goals. A Master of Science in Nursing is available in Charleston and Wheeling. A doctorate with emphasis in education administration is available in the Kanawha Valley in cooperation with Marshall University and the West Virginia College of Graduate Studies. A Ph.D. in biomedical sciences is offered in cooperation with the School of Medicine at Marshall University. Special courses may be offered at other locations in the state to meet specific needs.

Information about off-campus courses is available from the program unit offering the courses, the graduate centers, and the Office of the Director for Off-Campus Credit, West Everly Street. Graduate courses offered are approved by the appropriate department chairpersons, academic deans, director for off-campus credit, and by the

Records

University Facilities

Off-Campus Study

Assistant Vice President for Curriculum and Instruction. Advising and scholarship standards are the same for on-campus and off-campus study.

Non-Degree Graduate Students

Non-degree students may enroll in any course in the University for which they have the prerequisites and permission from the academic unit. Some departments that cannot accommodate non-degree students may restrict enrollments to majors only or require permits. These students are normally adults taking classes for enrichment purposes, public school teachers taking classes for certification renewal, or students taking classes as prerequisites for admission to degree programs. Since these students have not made a commitment to a degree program, are not subject to time limits, and may enroll on an irregular basis, the University policies concerning active/inactive status are more liberal than those for degree students. Non-degree students are considered active for five years or 20 terms. Once inactive, students may not register for classes until they reapply, reactivate their records, and pay the required fee.

Credit Limits

A non-degree graduate student may accumulate unlimited graduate credit hours, but if the student is later admitted to a degree program, the faculty of that program will decide whether or not any credit earned as a non-degree student may be applied to the degree. Under no circumstances may a non-degree student apply more than 12 hours of previously earned credit toward a degree.

Advising

Each dean establishes a mechanism to advise non-degree graduate students who intend to take the majority of their course work in the dean's school or college. The mechanism may be the designation of a faculty member to advise non-degree students or the assignment of non-degree students to an advising office or center.

Non-degree students who express an interest in programs in two colleges may be assigned to either by the Office of Admissions and Records. It is expected that the assigned adviser will consult the other unit for information when it is needed to assist the student.

Students who are truly undecided on a major or who plan to take courses in several schools or colleges for enrichment may be assigned to the Office of the Assistant Vice President for Curriculum and Instruction. The number of students assigned in this manner will be quite small, and a program adviser will be assigned when a student designates a specific interest.

Evaluation Fee

Only students who are enrolled in classes for the semester in which they expect to graduate but do not use University facilities pay a non-enrolled graduate student evaluation fee. Students may register for this fee after completing their course work but at least two weeks before graduation. Students who are not enrolled in regular course work but who do use University facilities must sign up for one hour of research each semester. Instructions for registering for this fee are available at the Office of Admissions and Records. This special fee can be assessed only once.

Full-Time and Part-Time Classification

A student is classified as full-time or part-time for any given enrollment period. A graduate student is classified as full-time if enrolled for nine hours in a semester or six hours altogether in the summer.

Students may enroll in courses without working for a grade or for credit by registering as auditors. Change in status from audit to credit or from credit to audit may be made during the registration period. Attendance requirements for auditors are determined by the instructor of the course being audited. It is the prerogative of the instructor to strike the name of any auditor from grade report forms and to instruct the Office of Admissions and Records to withdraw the auditor from the class, if attendance requirements are not met. Auditors are required to follow the same admission procedures as students taking the course for credit.

Students' academic rights and responsibilities are governed by Board of Trustees' policies and corresponding policies, rules, and regulations developed by each of the institutions in the University of West Virginia system of education. The rights and responsibilities of students at West Virginia University are published each year in the WVU Student Handbook. Copies of the WVU Student Handbook may be obtained from the Office of Student Life in Moore Hall.

Because of their familiarity to most students, letter grades are assigned in many graduate courses. However, better than "average" performance is expected of graduate students. They are enrolled for fewer credit hours than they were as undergraduates (9 to 12 hours being the norm for a full-time graduate student) and are expected to spend more time on each course and achieve better than average mastery of the material. A few grades of C can be tolerated in graduate programs provided there are higher grades in other courses to compensate for them. However, a grade of C is considered average performance for an undergraduate student and not for one who is studying for an advanced degree.

**Academic
Rights and
Responsibilities**

Scholarship

Grading System

A—excellent (given only to students of superior ability and attainment)

B—good (given only to students who are well above average, but not in the highest group)

C—fair (average for undergraduate students, but substandard for

C—graduate students)

D—poor but passing (cannot be counted for graduate degree credit)

F—failure

I—incomplete

W—withdrawal from a course before the date specified in the University Calendar. Students may not withdraw from a course after the specified date unless they withdraw from the University

WU—withdrawal from the University doing unsatisfactory work

P—pass (cannot be counted for graduate degree credit—see below)

X—auditor (no grade and no credit)

S—satisfactory

U—unsatisfactory (equivalent to D or F)

Pass/Fail grading is not applicable to the course work for a graduate degree. A graduate student may register for any course (1-499) on a Pass/Fail basis only if the course involved is not included in the student's plan of study and does not count toward a graduate degree. The selection of a course for Pass/Fail grading must be made at registration and may not be changed after the close of the registration period. A student who, having taken a course on a Pass/Fail basis, later decides to include the course as part of a degree

program must re-register for the course on a graded (A, B, C, D, or F) basis.

Courses graded S/U are approved by the Assistant Vice President for Curriculum and Instruction. Approved requests are forwarded to the Office of Admissions and Records for entry into the WVU Master Course Directory.

Grade-Point Average

The grade-point average is computed on all work for which the student has registered while a graduate student except for courses with grades of I, S, W, WU, P, and X, and is based on the following grade-point values:

A	B	C	D	F	U
4	3	2	1	0	0

Incompletes

When a student receives a grade of I and later removes the incomplete grade, the grade-point average is recalculated on the basis of the new grade. The grade of I is given when the instructor believes that the course work is unavoidably incomplete or that a supplementary examination is justifiable. Before any graduate degree can be awarded, the grade of I must be removed either by removal of the incomplete sometime before program completion or by having it recorded as a permanent incomplete. Only the instructor who recorded the I, or, if the instructor is no longer at WVU, the chairperson of the unit in which the course was given, may initiate either of these actions.

In the case of withdrawal from the University, a student with a grade of I should discuss that grade with the appropriate instructor. If other provisions are not made, an I grade eventually converts to F.

Grade changes other than I to a letter grade must be accompanied by an explanatory memo.

Transcripts

A transcript costs \$3.00 in cash or money order. Two or three weeks may be required to process an application for a transcript at the close of a semester or summer term. At other times the service requires approximately 48 hours from receipt of the request.

An application for a transcript of credit earned must furnish the date of last attendance at WVU and student identification number. A married woman should give both her maiden and married name.

All requests for transcripts must be sent, in writing, directly to the Office of Admissions and Records; no phone requests are accepted.

Students who default in the payment of any University financial obligation forfeit their right to claim a transcript until such time that the obligation has been satisfied.

The minimum academic standards for the different classifications are:

To be in good standing, regular students must obtain a 2.75 grade-point average in the first 12 hours of graduate study and maintain this average throughout the time they are enrolled in graduate work. A student failing to achieve this standard will be placed on probation and must achieve a cumulative grade-point average of 2.75 by the end of the next enrollment at West Virginia University. In the case of a part-time graduate student, a 2.75 cumulative grade-point average must be obtained in the next nine

hours of graduate study. A student who cannot attain the required average will be suspended.

A provisional student has been admitted to the University with one or more deficiencies. Consequently, by completion of the 18th credit hour, the student must meet the provisions stated in the letter of admission and attain a minimum grade-point average of 2.75. A student who fails to meet the provisions of admission or who fails to achieve the required grade-point average will be suspended. Students who meet the provisions of admission and the required grade-point average will be reclassified as regular students, and the regulations governing good standing for regular students will apply.

Provisional

To be in good standing, a non-degree student must obtain a 2.25 grade-point average in the first 12 hours of graduate study and maintain this average throughout the time enrolled in graduate work. A student failing to achieve this standard will be placed on probation and must achieve a cumulative grade-point average of 2.25 by the end of the next enrollment (or nine credit hours for part-time students) at West Virginia University. Students who cannot attain the required average will be suspended. A non-degree student who later wishes to apply for admission to a degree program must have achieved a minimum grade-point average of 2.75 on all course work taken since admission as a graduate student in order to be considered.

Non-Degree

Only grades in courses numbered 200 and above are computed in a graduate student's grade-point average; however, if any student receives grades lower than C for one-half or more of any course work attempted during one enrollment period, the student will be suspended. Credit hours for courses in which the grade is lower than C will not be counted toward satisfying graduate degree requirements.

All Students

These standards are the minimum standards for the University. A graduate program may set higher standards which the student must meet, but these must be presented in writing to all students upon admission or published in the catalog.

There are two types of withdrawals: withdrawal from some part of the work for which a student has registered, and a complete withdrawal from the University. Unless the formal withdrawal procedures are completed, failing grades are recorded. Withdrawals from some part of the work must have the initial approval of the student's adviser. It is the student's responsibility to see that all forms are properly executed and delivered to the appropriate authorities for recording.

Withdrawals

Until the Friday of the tenth week of class (or Friday of the fourth week in a six-week summer session, or Friday of the second week of a three-week summer session), students may withdraw from individual courses. Deadlines are published in the WVU Schedule of Courses each semester.

From Classes Deadlines

Students must obtain their adviser's signature on the University course adjustment form and submit the completed form to the Office of Admissions and Records. Before withdrawing from classes, students, with the help of their academic advisers, are responsible for determining:

Procedures

- If their course load would be reduced below the minimum requirement set by their program;

• If their course load would be reduced below the minimum number of hours required to qualify for financial aid or international full-time student status;

• If the course to be dropped is a corequisite to another course the student is taking or a prerequisite to a course required the following semester. If so, the student may be required to drop the corequisite course or asked to take a substitute course the following semester.

Students who withdraw from courses before the published deadline and who follow all of the established University procedures receive a W on their transcript for the appropriate course(s). The grade-point average is not affected in any way by this mark.

Students who decide to leave WVU should withdraw from all classes and must do so in accordance with established University policy in order that the official transcript may reflect this action.

Students are responsible for all financial obligations and for following established procedures, including the completion of forms and delivery of the completed forms to appropriate officials. Students not fulfilling these requirements may have difficulty withdrawing from the University. The withdrawal becomes official only after the forms have been recorded by Admissions and Records. Students receive copies and are urged to keep them.

Any student (full- or part-time) may withdraw from all classes for which he/she is registered in the University any time before the last day on which regular classes are scheduled to meet as established by the University calendar and published in the *Schedule of Courses*.

Students who desire to withdraw from all remaining classes should report in person to the Office of Student Life at the main lobby information desk of Moore Hall. Withdrawal procedures will be explained at that time. Identification (ID) and PRT cards must be presented. Students who are unable to withdraw in person because of illness, accident, or other valid reasons still must notify the Office of Student Life of their intention to withdraw. The notice should be verified in writing and the student ID and PRT cards enclosed.

Students are responsible with the help of their academic advisers for determining how withdrawal from the University may affect their future status at the University including such aspects as suspension for failure to make progress toward a degree or a violation of established academic probation and eligibility for scholarship, fellowship, or financial aid.

Students and faculty have together formulated the University's policy on absences from classes, which spells out the responsibilities of student and instructor as follows:

The student who is absent from class for any reason is responsible for work missed. Students should understand that absences may jeopardize their grades or continuance in the course. Instructors who use absence records in the determination of grades must announce this fact to students (in writing) within the first five class meetings. It is the responsibility of the instructor to keep an accurate record of all students enrolled. Instructors may report excessive absences to the student's dean or adviser. Students who have been absent because of illness, authorized University activities, or for other valid

From the University

Deadlines

Procedures

Absences

reasons are to have the opportunity to make up regularly scheduled examinations.

As a matter of good manners, a student should inform an instructor in advance if obliged to be absent from a class meeting.

Undergraduate students wishing to obtain graduate credit by senior petition must obtain the standardized permission form from the Office of Admissions and Records. This form requires the signature of the student's undergraduate adviser and the head of the unit offering the graduate course.

The policies regulating an undergraduate's enrollment in a graduate-level course for graduate credit are:

- Enrollment is only permitted in courses numbered 300-399.
- Undergraduates must be within 12 credit hours of their baccalaureate degrees with a grade-point average of 3.0 on a 4.0 scale.
- The maximum amount of graduate credit permitted by senior petition is 12 credit hours.
- The senior petition must be approved prior to or at the time of enrollment.

Approved senior petitions are returned to the Office of Admissions and Records so that a notation of graduate credit may be placed on the student's transcript.

Any exceptions to the regulations must be approved by the dean of the school or college in which the student seeks graduate credit.

Note: Students receiving graduate credit for a course do not receive credit toward their undergraduate degree with the same course.

Degree Completion

Admission to candidacy for any graduate degree is an additional requirement over and above admission as a graduate student and admission to a graduate program in a particular department, school, or college. A candidate for a graduate degree is a student who has satisfactorily completed a suitable period of graduate work in residence as a regular graduate student and who has demonstrated the ability to do work of graduate caliber to the satisfaction of his/her adviser and graduate committee.

Any graduate student who conducts research involving experiments that utilize animals must have a protocol approved by the Animal Care and Use Committee before starting the research. Information about procedures and protocol forms may be obtained from the Office of Sponsored Programs.

Any graduate student who conducts research involving the use of human subjects must have the approval of the Institutional Review Board for the Protection of Human Subjects before starting the research. Information about procedures and approval forms may be obtained from the Office of Sponsored Programs.

Theses and dissertations should be presented to the student's graduate adviser or committee chairperson at least one month before the end of the enrollment period in which completion of all requirements is expected. The form prescribed in the "Regulations Governing the Preparation of Dissertations and Theses" must be followed with

Graduate Credit Via Senior Petition

Candidacy

Use of Experimental Animal Subjects in Research

Use of Human Subjects in Research

Theses and Dissertations

the guidance of the student's graduate adviser or the chairperson of the student's committee. For the manuscript to be approved, there must be no more than one unfavorable vote among members of the student's committee. Two copies with original signatures in approved typewritten form (master's theses in bound form and doctoral dissertations unbound) must be delivered to the Charles C. Wise, Jr. Library at least one week before the close of the period in which the degree is expected to be completed (one week before the end of the second summer session, by the last day of the final examination period at the end of the first semester, or one week before Commencement Day at the end of the second semester).

**Problem
Reports
Students'
Committees**

Problem reports are deposited with the major department in the form and by the dates the department requires.

Doctoral dissertation committees consist of no fewer than five members, the majority of which must be regular graduate faculty including the chairperson. No more than one person may be a non-member of the graduate faculty. Master's committees of programs requiring a thesis consist of no fewer than three members, the majority of which must be regular graduate faculty including the chairperson. No more than one person may be a non-member.

Master's committees of programs not requiring a thesis consist of no fewer than three members, one of which must be a regular graduate faculty member. No more than one person may be a non-member, and the non-member cannot chair or advise.

Students are not to be affected by the re-evaluation of faculty members. Once a graduate committee has been established for a student, it will not be necessary to alter it because of a change in graduate faculty status for one of the faculty members on the committee.

No family member can serve on the graduate committee of his/her relative.

At least one member of every doctoral committee must be from a department other than the one in which the student is seeking a degree. It is recommended, but not required, that this standard also be applied to master's degree committees. A majority of the members of all graduate committees must be graduate faculty members. Doctoral committees and master's degree committees of programs requiring a thesis must have a majority of regular graduate faculty members.

All graduate committees are subject to the approval of the school or college dean or the dean's designee.

At the time of registration for the enrollment period in which all degree requirements are expected to be met, or at the latest within two weeks after such registration, each candidate is to submit a formal request for the conferring of the degree. This is done on an "Application for Graduation and Diploma" form obtainable from the school or college dean's office. The candidate must complete all requirements at least one week before the end of that enrollment period. If the degree is not actually earned during that term, the student must submit a new "Application for Graduation and Diploma" when registering for the term in which completion is again anticipated.

**Commencement,
Diplomas**

Colleges and schools are responsible for seeing that master's and doctoral students meet the minimum requirements of the University

as well as any additional college or school requirements. Deans' offices are responsible for maintaining all student records necessary to certify students for graduation. Attendance at the spring Commencement is voluntary. Anyone not planning to attend should leave a complete mailing address with the Office of Admissions and Records so that the diploma can be mailed.

Summary of Requirements

Regulations governing admission, registration, scholarship, etc., described in the preceding sections must be followed.

At least 30 hours of graduate work planned with the student's graduate adviser must be satisfactorily completed within the period of eight years immediately preceding the conferring of the degree. Each student, through consultation with a graduate adviser, must meet the special requirements of the faculty of the field of major study. The program must be formulated in writing at the earliest possible date and a copy filed with the appropriate office so as to result in a cohesive, unified, and continuous plan of study. Most plans of study consist of certain amounts of work in major and minor fields. These are described in the departmental programs in Part 2 of this catalog. In degree programs requiring a thesis or problem report, appropriate course credits may be taken to cover the research and writing, but no more than six hours of credit earned for research or thesis may be counted in meeting course requirements for the degree.

The final examination is not to be given until the semester or summer session in which all other requirements for the degree are to be met. The student's committee chairperson must indicate in advance the time, place, and recommended examining committee members and receive clearance from the office of the school or college dean before the examination can be given.

The student cannot be considered as having satisfactorily passed the final examination if there is more than one unfavorable vote among members of the examining committee. Results of each examination must be reported to the school or college dean within 24 hours. Re-examination may not be scheduled without approval of the request by the school or college dean. All committee members are to be present for the final examination. If an examination cannot be scheduled at a time convenient to all committee members, the dean or his/her designee may permit another faculty member to substitute for the original committee member, provided that the original committee member was not the chair. There can be no substitute for the chair. Only one substitute is allowed, and the request for a substitute must be made in writing prior to the examination. The request for a substitute should be signed by the committee chair, the student, and both the original faculty member and the substitute faculty member. A substitute faculty member must have the same or higher graduate faculty status as the original faculty member and represent the same academic discipline or specialization.

If the requirements for the master's degree include a thesis, the thesis must bear the original signatures of at least all but one of the committee members. If more than one member of the committee, whatever the size of the committee, dissents from approving the thesis, the degree cannot be recommended. If a substitute faculty

Master's Degrees

Final Examination

**Procedures for
Master's
Degrees**

member attends the final examination, the substitute signs the shuttle sheet; however the original committee member is to sign the thesis.

Theses must be presented to the University at least one week before the degree is expected to be granted.

1. Letter of inquiry from prospective student to department chairperson (program inquiries) or to Office of Admissions and Records (general information inquiries).

2. Mailing of graduate application form to student from the Office of Admissions and Records.

3. Receipt of application materials and required fee by the Office of Admissions and Records.

4. Referral of application materials to appropriate program by the Office of Admissions and Records.

5. The department in question notifies the Office of Admissions and Records of the admission action.

6. The student arrives, reports to the program department, is assigned an adviser, and registers for course work.

7. Shortly after admission to the program (usually within the first 9-12 semester hours of course work), an advisory committee is formed and produces the student's plan of study.

8. Student completes requisite course work and other program requirements.

9. Student confers with adviser and, if applicable, chairperson of thesis committee to see if all requirements can be met by the end of the semester in which he/she plans to graduate. This should be done no later than the beginning of the final semester.

10. Student registers for either a course or for the Non-Enrolled Graduate Student Evaluation Fee (\$50). No one may graduate who is not registered as a student during the semester of graduation.

11. Student checks with the University to insure that there is correspondence between departmental and University records and that there are no remaining deficiencies.

12. Student completes an "Application for Graduation and Diploma." This should be done no later than two weeks after registration.

13. After getting a fee slip from the Office of Admissions and Records, the student pays the \$20 Graduation Fee at the Cashier's window in the Mountainlair.

14. (If applicable) The student presents a typed draft of the thesis to each committee member.

15. The student should remind the committee chairperson to request clearance from the school or college dean's office at least two weeks before the date of the final examination (or thesis defense).

16. Results of the final examination (or thesis defense) must be reported to the dean's office by the graduate adviser or the committee chairperson not later than one week before the end of the semester or summer session in which the degree is expected to be granted.

17. Two bound and originally signed copies of the thesis (the original and first copy or two electrostatically-reproduced copies) must be submitted to the Charles C. Wise, Jr. Library no later than one week before the degree is expected to be granted.

Doctoral Degrees

Regulations governing admission, registration, scholarship, etc., described in the preceding sections must be followed. In addition, the student must satisfy the requirements specified by the faculty responsible for the major field. Students applying for admission to a doctoral program, after having received a master's degree at WVU, must file a new application for graduate work with the Office of Admissions and Records.

All of the requirements for any graduate degree must be completed within the time limits described earlier.

The program of doctoral study is planned with the student's graduate adviser and committee to combine any or all of the following: graduate courses of instruction, special seminars, independent study, supervised research, and supervised training designed to promote a broad and systematic knowledge of the major field and to prepare the student for the comprehensive qualifying and final examinations and writing of the dissertation.

Graduate education, especially at the doctoral level, involves many learning experiences which take place outside the formal classroom setting. These involve observing and participating in activities conducted by the graduate faculty, using departmental and University libraries, attending lectures presented by visiting scholars, informal debates with fellow students, and similar activities.

To insure that graduate students experience these kinds of informal learning, WVU requires at least one year in residence in full-time graduate study at the doctoral level. Some WVU doctoral programs require a longer residency.

Admission to graduate study and enrollment in graduate courses does not of itself imply acceptance of the student as a candidate for a doctoral degree. This is only accomplished by satisfactorily passing a comprehensive or qualifying examination (either oral, or written, or both) and by meeting specified language and/or other requirements.

A student will be given a comprehensive examination to demonstrate knowledge of the important phases and problems of the field of major study, their relation to other fields, and the ability to employ the instruments of research. The examination is intended to determine whether the student has the academic competence to undertake independent research in the discipline, and to insure that the student possesses a thorough grasp of the fields outlined on the plan of study.

The examination, which consists of a series of tests covering all areas specified in the plan of study, is to be administered after most formal studies have been completed. Scheduling and results of the examination must be reported to the school or college dean.

It must be the consensus of the doctoral committee that the student has passed the examination, although the committee may permit one dissenting vote. A single portion of the examination may be repeated at the discretion of the committee, but if two or more members are dissatisfied, the entire qualifying examination must be repeated. The student must petition through the doctoral committee

Program

Residence

Candidacy Requirements

Qualifying Examination

Foreign Language Examinations

in order to be permitted to repeat a qualifying examination, and it is anticipated that a waiting period will be specified by the committee during which the student will have opportunity to correct deficiencies. Academic tradition does not allow for a qualifying examination to be administered more than three times.

Competence in one or more foreign languages is a common requirement in graduate degree programs. The faculty in the graduate degree program specify the language or languages and the level of competence to be demonstrated.

Language examinations are arranged by the foreign language examiner, who can be contacted through the Department of Foreign Languages, and under whose direction language examinations are administered.

When only reading competence is required, the foreign language examiner may waive examination in cases where the student's transcript shows, at a date that proves to fall no earlier than seven years before promotion to candidacy for the doctorate, either completion of 12 semester hours or equivalent of course work in an approved foreign language, at WVU or at any other institution of recognized standing, with a grade of B or better in the last three hours, or completion of French 306, German 306, or Russian 306 at WVU with a grade of B or better.

Candidacy for the doctoral degree is granted when a student is certified as having successfully completed the qualifying examination, satisfied the language requirements, and met any additional requirements specified by the academic unit.

Dissertation

The candidate must submit a dissertation pursued under the direction of the faculty of the University on some topic in the field of the major subject. The dissertation must present the results of the candidate's individual investigation and must embody a definite contribution to knowledge. While conducting research or writing a dissertation, the student must register at the beginning of each semester or summer during which credit is being earned. No residence credit will be allowed for special field assignments or other work taken off the University campus without prior approval by the Assistant Vice President for Curriculum and Instruction.

Final Examination

The final examination is not given until the semester or summer session in which all other requirements for the degree are to be met. After the candidate's dissertation has been tentatively approved, the final oral examination on the dissertation can be scheduled. At the option of the faculty responsible for the degree program, a comprehensive final written examination also may be required. The student's committee chairperson must indicate in advance the time, place, and recommended examining committee members and receive clearance from the office of the school or college dean before the examination can be given. Such notifications of doctoral examinations must be received at least three weeks before the examination date. All doctoral final oral examinations are open examinations and the lead time is required for public notice to the University community.

The student cannot be considered as having satisfactorily passed the final examination if there is more than one unfavorable vote among members of the examining committee. Results of each examination must be reported to the school or college dean within 24

hours. Re-examination may not be scheduled without approval of the request by the school or college dean. All committee members are to be present for the final examination. If an examination cannot be scheduled at a time convenient to all committee members, the dean or his/her designee may permit another faculty member to substitute for the original committee member, provided that the original committee member was not the chair. There can be no substitute for the chair. Only one substitute is allowed, and the request for a substitute must be made in writing prior to the examination. The request for a substitute should be signed by the committee chair, the student, and both the original faculty member and the substitute faculty member. A substitute faculty member must have the same or higher graduate faculty status as the original faculty member and represent the same academic discipline or specialization.

The requirements for a doctorate include acceptance of the dissertation. The dissertation must bear the original signatures of at least all but one of the committee members. If more than one member of the committee, whatever the size of the committee, dissents from approving the dissertation, the degree cannot be recommended. If a substitute faculty member attends the final examination, the substitute signs the shuttle sheet; however, the original committee member is to sign the dissertation. The dissertation must be presented to the University not later than one week before the end of the semester or summer session in which the degree is expected to be granted (one week before the end of the summer, by the last day of the final examination period at the end of the first semester, or one week before Commencement Day at the end of the second semester).

All doctoral dissertations and their abstracts will be microfilmed through University Microfilms, Ann Arbor, Michigan. This requirement will not be satisfied by any other publication but does not preclude publication elsewhere, which is both permitted and encouraged.

Candidates are to follow "Regulations Governing the Preparation of Dissertations and Theses" regarding format and organization of the dissertation, which is on file at the department offices, offices of all graduate advisers, and the University libraries. The candidate is required to maintain close contact with the supervisor or chairperson of the graduate committee on these matters in developing a dissertation so as to incorporate the special requirements of the subject discipline.

One week before the close of the semester or summer in which the degree is expected to be conferred the candidate must meet the following requirements:

1. Submit in a form satisfactory for microfilming, the typewritten, unbound original and first carbon copy of the dissertation. Two excellent machine-reproduced copies may be acceptable. Both copies must have original signatures of the candidate's committee.
2. Submit one extra abstract using no more than 350 words. This separate abstract must have at the top of the first page the centered exact title of the dissertation, followed on the next line by the full name of the candidate, and on the next line by the word ABSTRACT. The extra abstract is on unnumbered pages.

Acceptance of Dissertation

Publication

Summary

Procedures for the Doctoral Degree

3. Submit a microfilm contract completed and signed by the candidate.

4. Pay a fee of \$45.00 to cover the cost of microfilming the dissertation and publication of the abstract in *Dissertation Abstracts*, a bi-monthly journal which receives wide distribution. This fee is payable by certified check or money order made out to "West Virginia University." If desired, copyright service can be provided through WVU upon receipt, along with the dissertation, of a certified check or money order for \$20.00 made payable to "University Microfilms."

5. Complete the questionnaire entitled "Survey of Earned Doctorates."

1. Letter of inquiry from prospective student to department chairperson (program inquiries) or to the Office of Admissions and Records (general information inquiries).

2. Mailing of graduate study application form to student from the Office of Admissions and Records.

3. Receipt of application materials and required fee by the Office of Admissions and Records.

4. Referral of application materials to the appropriate program by the Office of Admissions and Records.

5. The program in question notifies the Office of Admissions and Records of the admission action.

6. The student arrives, reports to the program department, is assigned an adviser, and registers for course work.

7. Shortly after admission to the program (usually within the first 9-12 semester hours of course work), an advisory committee is formed and produces the student's plan of study.

8. Student completes requisite course work and other program requirements, satisfying also the stipulated residency requirement.

9. Student takes the language examination (if applicable).

10. Student takes written and/or oral comprehensive (qualifying) examination for admission to candidacy. The results are communicated to the appropriate office by the student's graduate program adviser.

11. Student undertakes a doctoral dissertation under the guidance of a dissertation committee. The dissertation phase begins with approval of a dissertation prospectus by the dissertation committee, the department chairperson, and the school or college dean.

12. A copy of the preliminary draft of the dissertation is given to each committee member at least one month prior to the final oral examination.

13. The dissertation adviser (committee chairperson) requests a clearance for the final examination from the school or college dean's office *no later than three weeks before the scheduled date*.

14. The time and place of the examination is announced.

15. The student defends the dissertation in an oral defense.

16. The student delivers two copies of the approved dissertation, appropriate questionnaires, and fees to the Charles C. Wise, Jr. Library.

Part 3

FEES AND OTHER INFORMATION

All West Virginia University fees are subject to change without notice.

A nonrefundable special service fee of \$25 must accompany the application for admission to graduate studies. All fees are due and payable to the controller on the days of registration. Completion of arrangements with the controller's office for payment from officially accepted scholarships, loan funds, grants, or contracts shall be considered sufficient for acceptance of registration. Fees paid after regular registration must be paid to the University cashier.

Any student failing to complete registration on regular registration days is subject to a late registration fee.

Students registering pay the fees shown in the fees charts, plus special fees and deposits as required.

No degree is conferred upon any candidate and no transcripts are issued to any student before payment is made of all tuition, fees, and other indebtedness to any unit of the University.

It is the policy of West Virginia University to place on restriction students who have outstanding debts to a unit or units of the University. The restriction may include, but is not limited to, the withholding of a student's registration, a student's diploma, or a student's transcript.

Persons who are neither registered as University students nor are members of its administrative or teaching staffs shall not be admitted to regular attendance in University classes.

Fees for credit hours for off-campus students are the same as those charged students enrolled in on-campus courses. Off-campus students do not pay the faculty improvement fee, *Daily Athenaeum* fee, the radio station fee, or the Mountainlair construction fee. However, all students except students taking courses offered by the College of Business and Economics (who pay an \$80 course fee) must pay a \$40 course fee for each off-campus course taken.

Consult specific departmental sections of this catalog concerning nonrefundable deposits and microscope rentals.

All music majors must pay a fee of \$10.00 per semester, which entitles them to assigned practice space one hour per day. Additional space may be available at the rate of \$4.00 per hour.

Band and orchestra instruments may be rented by the semester for \$10.00.

Students may enroll in courses without working for grade or for credit by registering as auditors and by paying full fees.

According to legislation passed by the West Virginia Legislature in 1983, WVU is limited in the number of graduate and professional waivers that can be awarded each school year.

According to Board of Regents Policy Bulletin No. 49, WVU must give priority consideration in awarding these waivers to students who are West Virginia residents and also to faculty and staff of West Virginia public and private colleges and universities.

**Fee
Regulations**

**Off-Campus
Fees**

Lab Fees

Music

Instruments

Auditors

**Tuition and
Fee Waivers**

Special Fees

Application for admission (Dentistry and Medicine)	30.00
Application for admission (College of Law or Graduate Studies)	25.00
Certificate of Advanced Study in Education	2.00
Diploma replacement	20.00
Graduation	20.00
(Payable by all students at the beginning of the semester or session in which they expect to receive their degrees.)	
Late registration (nonrefundable)	20.00
(Not charged to students who complete registration during the regular registration days set forth in the University Calendar.)	
Non-enrolled graduate student evaluation fee	50.00
(For graduate students not otherwise enrolled at time of final exam.)	
Professional engineering degree (includes \$20.00 graduation fee)	35.00
Program reactivation fee (graduate students)	20.00
Reinstatement of student dropped from the rolls	10.00
Student identification card replacement	10.00
Student's record fee	3.00
Official transcript	3.00
Official letter (statement of degree/grade-point average)	3.00
Course descriptions	5.00
Priority service on above	5.00

Summer Tuition and Fees

Tuition	Resident	Nonresident
Graduate tuition per credit hour	70.00	217.00
Dentistry tuition per credit hour	129.00	320.00
Medicine tuition per credit hour	102.00	263.00
Daily Athenaeum Fee*	1.00	1.00
Radio Station Fee*	1.00	1.00
Health, Counseling, and Program Services Fee	33.00	33.00
Mountainlair Construction Fee, per six week summer session or any portion thereof*	19.00	19.00
Student Affairs Fee	10.00	10.00
Transportation Fee	17.00	17.00

*Fee required of all students. Nonrefundable unless student withdraws officially before the close of general registration.

Semester Fees in Colleges and Schools

(Subject to Change Without Notice.)

These fees as published here are accurate as of March 1, 1990.

You are advised to check with the Office of Admissions and Records for the current fee schedule.

FULL-TIME

Graduate						
Fee	Tuition	Registration	Higher Education Resources	Institutional Activity ³	Mountainlair Construction ⁴	Faculty Improvements ⁵
Resident	\$195.00	\$ 50.00	\$ 355.00 ¹	\$206.00	\$50.00	\$ 35.00
Nonresident	635.00	250.00	965.00	206.00	50.00	105.00
Dentistry						
Resident	\$335.00	\$ 50.00	\$ 750.00 ²	\$206.00	\$50.00	\$ 35.00
Nonresident	835.00	250.00	\$1,690.00	206.00	50.00	105.00
Medicine						
Resident	\$300.00	\$ 50.00	\$ 535.00 ^{2*}	\$206.00	\$50.00	\$ 35.00
Nonresident	800.00	250.00	1,220.00	206.00	50.00	105.00

Part-Time per credit hr.
\$ 70.00
\$217.00

For fee assessment purposes, a part-time graduate student is one who is registered for fewer than nine semester hours per semester during the regular academic year, or for fewer than six semester hours during one six-week summer session. Graduate students enrolled for nine or more credit hours pay maximum charges as indicated. Students enrolled for less than nine credit hours pay a prorated charge calculated in direct proportion to the number of credit hours taken. "Graduate," for fee purposes, includes all graduate studies programs.

¹Paid by Law and Graduate students only.

²Dental and Medical students pay appropriate laboratory and microscope fees.

³Includes Athletics Fee, \$40.00; Student Affairs Fee, \$26.00; Daily Athenaeum Fee, \$4.50; Health, Counseling, and Program Services Fee, \$8.00; Transportation Fee, \$45.00; Radio Station Fee, \$2.50.

⁴All part-time students enrolled for seven or more credit hours must pay the Institutional Activity Fee and the Mountainlair Construction Fee.

⁵Faculty Improvement Fee is charged to all students and is prorated for part-time students.

Please refer to the WVU Undergraduate Catalog for fee information for undergraduate programs.

Academic deans, directors, and vice presidents of other University of West Virginia Board of Trustees institutions are charged with responsibility of awarding tuition waivers. Students should contact the appropriate person in their department, school, or college for information regarding applications and priorities.

Refund of Fees

A student who officially withdraws from University courses may arrange for a refund of fees by submitting to the University controller evidence of eligibility for a refund during the semester.

To withdraw officially, a student must apply to the Division of Student Affairs for permission. Semester fees will be returned in accordance with the following schedule:

<i>Academic Year (Semester)</i>	<i>Refund</i>
During the first and second weeks	90%
During the third and fourth weeks	70%
During the fifth and sixth weeks	50%
Beginning with the seventh week	No Refund

To receive a refund of tuition, a student must apply for it at the Office of Admissions and Records. However, students cannot expect a refund if they drop a course or withdraw from the University after the last day for a tuition refund.

Summer Sessions and Non-Traditional Periods

Refunds for summer sessions and non-traditional periods are established based upon the refund rate for the academic year. (For specific information concerning summer session refunds, see the appropriate *Summer Schedule of Courses*.) Should the percentage calculation identify a partial day, the entire day will be included in the higher refund period.

No part of the activity fee is refundable unless the student withdraws from the University.

University policy provides that students called to the armed services of the United States may be granted full refund of refundable fees, but no credit, if the call comes before the end of the first three-fourths of the semester, and that full credit of courses be granted to persons called to the armed services of the United States if the call comes thereafter; provided, however, that credit as described above will be granted only in those courses in which the student is maintaining a passing mark at the time of departure for military service. In the recording of final grades, for three-fourths of a semester or more, both passing and failing grades are to be shown on the student's permanent record.

A service charge of \$10 will be collected on each check returned unpaid by the bank upon which it is drawn.

If the check returned by the bank was in payment of University and registration fees, the controller's office shall declare the fees unpaid and registration cancelled if the check has not been redeemed within three days from date of written notice. In such a case the student may be reinstated upon redemption of the check, payment of the \$10 service charge, the reinstatement fee of \$10, and the late payment fee of \$20.

Payments of tuition, fees, and other charges by check are subject to WVU's non-sufficient funds check policy. A copy of the policy is available in the bursar's office.

Service Charge on Returned Checks

Non-Sufficient Funds Check Policy

Cost of an Academic Year's Work

The Student Financial Aid Office estimates that the total cost of attending WVU for a nine-month academic year is \$8,100 for single West Virginia residents living on or off-campus and \$5,000 for those living at home; \$10,500 for single nonresidents living on or off-campus and \$7,750 for those living at home.

These typical estimated student budgets include tuition and fees, books and supplies, room, board, transportation, and personal expenses that provide for a modest but adequate life-style.

The Veterans Administration (VA) administers two basic educational programs for veterans. For eligible persons with service between February 1, 1955, and December 31, 1976, such assistance is available under the G.I. Bill. Eligible persons who initially entered the military on or after January 1, 1977, may receive educational assistance under a contributory plan.

Information regarding these educational opportunities at WVU may be obtained by contacting the Financial Aid Office, in the Mountainlair, P.O. Box 6004, Morgantown, WV 26506-6004.

West Virginia University annually awards over 800 graduate assistantships supported from state appropriations, federal funds, private grants, and contracts; and about 200 fellowships and traineeships derived from federal agencies and from industries and private foundations.

Fellowships are awarded on the basis of academic merit and require no service in return. Graduate fellows are expected to spend full time in pursuit of their studies, but may teach to the extent that the particular degree program requires. Most traineeships, provided through institutional grants, are also for full-time study without scheduled duties. Stipends for graduate assistantships are generally stated in terms of nine- and twelve-month appointments and require service to the institution. There are five kinds of graduate assistantships.

A person who holds a graduate assistantship is obligated to the extent of teaching two three-hour courses per semester, or for the equivalent in laboratory classes, or for other forms of departmental assistance, except research assistance, amounting to a minimum of 12 clock hours per week.

A research assistant is one whose duties consist of assisting in the research of a faculty member with an obligation of not less than 15 nor more than 20 clock hours per week in any semester.

A student employed as a graduate administrative assistant works part time in one of the administrative offices of WVU. The individual is primarily a student and secondarily an employee and is required to be a full-time graduate student. Assistantships obligate the student to no less than 12 nor more than 20 hours of work per week in any semester.

A teaching fellow is an advanced graduate student, usually in a doctoral program, who would qualify for a junior faculty position if that person were not a graduate student at WVU. A teaching fellow may be given major responsibility for the design and/or operation of a course, whereas such responsibility is not placed on a graduate teaching assistant.

Veterans Educational Assistance

Assistantships, Fellowships, and Traineeships

Graduate Teaching Assistant

Graduate Research Assistant Graduate Administrative Assistant

Teaching Fellow

**Graduate
Residence Hall
Assistant**

Residence hall graduate assistants' duties and responsibilities obligate them to not less than 20 clock hours of work per week. Their job responsibilities entail the planning and implementation of developmental educational programming in the residence halls.

All graduate assistants, fellows, and trainees are required to be full-time graduate students. Tuition and registration fees generally are remitted upon application.

Awards are made by degree programs or by the non-academic unit where service is to be rendered. Applications should be made to the dean or director concerned or to the chairperson of the program in which the graduate work will be pursued. Early application is strongly recommended.

Students may hold only one appointment as a graduate assistant per term.

**Remission
of Fees**

Students appointed as graduate assistants are eligible to apply for remission of tuition and certain fees. Tuition and some fees are generally remitted or paid for fellows and trainees. All students must pay the Mountainlair construction, radio station, and *Daily Atheneum* fees, but graduate assistants, fellows, and trainees are granted the same option as part-time students with regard to the remainder of the institution activity fee.

**Arlen G.
and Louise
Stone Swiger
Doctoral
Fellowships**

Arlen G. and Louise Stone Swiger have been special benefactors to WVU in their establishment of this fellowship program through the West Virginia University Foundation, Inc. Both were WVU graduates. Arlen G. Swiger, a successful New York attorney, bequeathed to the University half of his estate which became available to the WVU Foundation upon the death of his widow, Louise Stone Swiger. These fellowships are open to doctoral students. Selection is competitive on the basis of academic merit. Application should be made early in the year preceding the year of anticipated enrollment in a doctoral program. Inquiries should be directed to the office of the assistant vice president for curriculum and instruction.

**W. E. B. DuBois
Fellowships
For Black
Graduate and
Professional
Students**

Dr. William Edward Burghardt DuBois was born in 1868. He was educated at Fisk University and received his Ph.D. from Harvard University in 1896. Dr. DuBois was one of the founders of the National Association for the Advancement of Colored People and the Pan-African Congress Movement. Author of many historical and analytical studies of American and African society, his example provides a standard of excellence for scholarship in any discipline and an especially inspiring model for black scholars. Because of the achievements of Dr. DuBois, West Virginia University has named this fellowship program in his honor.

The fellowships are open to black graduate and professional students who are native or naturalized U.S. citizens. Selection is competitive on the basis of academic merit and potential for success in graduate or professional study. Inquiries should be directed to the graduate or professional program of choice or to the assistant vice president for curriculum and instruction.

**University
Advising Center**

Assistantships are available through the University Advising Center for students who have been admitted to a graduate program. Those who are accepted will provide academic advising services to freshman and sophomore students. A stipend is paid and tuition and

registration fees are also waived. Contact the Office of the Director in the Student Services Center for information and applications.

Approximately 100 positions are available for single graduate and undergraduate students to serve as resident assistants in the University residence halls. Selection is based on the applicant's academic record, previous background and experience, and interpersonal relationship skills.

Resident assistants serve as members of the staff of Student Affairs advising approximately 50 freshman students on floors in University residence halls. Staff without prior residence hall experience receive room and half-board. Experienced staff receive room and full board. Graduate staff members receive a waiver of tuition and optional fees. Applications are available in December and nine-month appointments are made in April for the following academic year. For further information and an application, write to the Assistant Director of Residence Life, G-106 Towers, West Virginia University, Morgantown, WV 26506.

Information and guidance on loans for graduate students are available in the Student Financial Aid Office, Mountainlair. On-campus employment opportunities can be investigated at the Student Financial Aid Office in Mountainlair and the Human Resources Office in Knapp Hall. A summer and part-time job service is operated by the WVU Career Services Center in Mountainlair. Its purpose is to place students in part-time or temporary jobs in Morgantown and the surrounding area.

Students are encouraged to submit applications to outside agencies that support graduate-level study and research. Among the opportunities available are programs sponsored by the Fulbright-Hays Training Grants, the National Science Foundation, the Marshall Scholarship Program, the National Institutes of Health, the Oak Ridge Associated Universities, and the Rhodes Scholarships. Students should contact the Office of Sponsored Programs for assistance in applying for these programs. In most cases, this office will refer the student to a faculty adviser who can provide detailed assistance. Several national agencies publish information about fellowships and financial aid opportunities for graduate students. Individuals interested in reviewing this information should consult the personnel at the reference desk of the Charles C. Wise, Jr. Library.

Resident Assistantships

Financial Aid: Loans, Employment

Fellowship Opportunities for Study In the United States or Abroad

Residency Policy for Admission and Fee Purposes

1.1 Students enrolling in a West Virginia public institution of higher education shall be assigned a residency status for admission, tuition, and fee purposes by the institutional officer designated by the President. In determining residency classification, the issue is essentially one of domicile. In general, the domicile of a person is that person's true, fixed, permanent home and place of habitation. The decision shall be based upon information furnished by the student and all other relevant information. The designated officer is authorized to require such written documents, affidavits, verifications, or other evidence as is deemed necessary to establish the domicile of a student. The burden of establishing domicile for admission, tuition, and fee purposes is upon the student.

Classification Section 1.

1.2 If there is a question as to domicile, the matter must be brought to the attention of the designated officer at least two weeks prior to the deadline for the payment of tuition and fees. Any student found to have made a false or misleading statement concerning domicile shall be subject to institutional disciplinary action and will be charged the nonresident fees for each academic term theretofore attended.

1.3 The previous determination of a student's domiciliary status by one institution is not conclusive or binding when subsequently considered by another institution; however, assuming no change of facts, the prior judgment should be given strong consideration in the interest of consistency. Out-of-state students being assessed resident tuition and fees as a result of a reciprocity agreement may not transfer said reciprocity status to another public institution in West Virginia.

**Residence
Determined by
Domicile
Section 2.**

2.1 Domicile within the state means adoption of the state as the fixed permanent home and involves personal presence within the state with no intent on the part of the applicant or, in the case of a dependent student, the applicant's parent(s) to return to another state or country. Residing with relatives (other than parent(s)/guardian) does not, in and of itself, cause the student to attain domicile in this state for admission or fee payment purposes. West Virginia domicile may be established upon the completion of at least twelve months of continued presence within the state prior to the date of registration, provided that such twelve months' presence is not primarily for the purpose of attendance at any institution of higher education in West Virginia. Establishment of West Virginia domicile with less than twelve months' presence prior to the date of registration must be supported by evidence of positive and unequivocal action. In determining domicile, institutional officials should give consideration to such factors as the ownership or lease of a permanently occupied home in West Virginia, full-time employment within the state, paying West Virginia property tax, filing West Virginia income tax returns, registering of motor vehicles in West Virginia, possessing a valid West Virginia driver's license, and marriage to a person already domiciled in West Virginia. Proof of a number of these actions shall be considered only as evidence which may be used in determining whether or not a domicile has been established. Factors militating against the establishment of West Virginia domicile might include such considerations as the student not being self-supporting, being claimed as a dependent on federal or state income tax returns or the parents' health insurance policy if the parents reside out of state, receiving financial assistance from state student aid programs in other states, and leaving the state when school is not in session.

**Dependency
Status
Section 3.**

3.1 A dependent student is one who is listed as a dependent on the federal or state income tax return of his/her parent(s) or legal guardian or who receives major financial support from that person. Such a student maintains the same domicile as that of the parent(s) or legal guardian. In the event the parents are divorced or legally separated, the dependent student takes the domicile of the parent with whom he/she lives or to whom he/she has been assigned by court order. However, a dependent student who enrolls and is

properly classified as an in-state student maintains that classification as long as the enrollment is continuous and that student does not attain independence and establish domicile in another state.

3.2 A nonresident student who becomes independent while a student at an institution of higher education in West Virginia does not, by reason of such independence alone, attain domicile in this state for admission or fee payment purposes.

4.1 A person who has been classified as an out-of-state student and who seeks resident status in West Virginia must assume the burden of providing conclusive evidence that he/she has established domicile in West Virginia with the intention of making the permanent home in this state. The intent to remain indefinitely in West Virginia is evidence not only by a person's statements, but also by that person's actions. In making a determination regarding a request for change in residency status, the designated institutional officer shall consider those actions referenced in Section 2 above. The change in classification, if deemed to be warranted, shall be effective for the academic term or semester next following the date of the application for reclassification.

5.1 An individual who is on full-time active military service in another state or foreign country or an employee of the federal government shall be classified as an in-state student for the purpose of payment of tuition and fees, provided that the person established a domicile in West Virginia prior to entrance into federal service, entered the federal service from West Virginia, and has at no time while in federal service claimed or established a domicile in another state. Sworn statements attesting to these conditions may be required. The spouse and dependent children of such individuals shall also be classified as in-state students for tuition and fee purposes.

5.2 Persons assigned to full-time active military service in West Virginia and residing in the state shall be classified as in-state students for tuition and fee purposes. The spouse and dependent children of such individuals shall also be classified as in-state students for tuition and fee purposes.

6.1 An alien who is in the United States on a resident visa or who has filed a petition for naturalization in the naturalization court, and who has established a bona fide domicile in West Virginia as defined in Section 2 may be eligible for in-state residency classification, provided that person is in the state for purposes other than to attempt to qualify for residency status as a student. Political refugees admitted into the United States for an indefinite period of time and without restriction on the maintenance of a foreign domicile may be eligible for an in-state classification as defined in Section 2. Any person holding a student or other temporary visa cannot be classified as an in-state student.

7.1 A person who was formerly domiciled in the state of West Virginia and who would have been eligible for an in-state residency classification at the time of his/her departure from the state may be immediately eligible for classification as a West Virginia resident provided such person returns to West Virginia within a one year period of time and satisfies the conditions of Section 2 regarding proof of domicile and intent to remain permanently in West Virginia.

Change of Residence Section 4.

Military Section 5.

Aliens Section 6.

Former Domicile Section 7.

**Appeal Process
Section 8.**

8.1 The decisions of the designated institutional officer charged with the determination of residency classification may be appealed to the President of the institution. The President may establish such committees and procedures as are determined to be appropriate for the processing of appeals. The decision of the President of the institution may be appealed in writing with supporting documentation to the University of West Virginia Board of Trustees in accord with such procedures as may be prescribed from time to time by the Board.

University Environment and Facilities

**Morgantown
Area**

Located on the east bank of the Monongahela River, which flows north to nearby Pittsburgh, Morgantown is situated on rugged terrain in the Appalachian highlands. The altitude of the city varies from 800 to 1,150 feet above sea level, and the surrounding hills rise eastward to Chestnut Ridge and reach an altitude of 2,600 feet just ten miles from the city.

A north-south interstate highway, I-79, is one mile west of Morgantown. U.S. 19 and U.S. 119 pass through Morgantown in the north-south direction. U.S. 48, a four-lane east-west highway, links I-79 at Morgantown to I-81 in the Cumberland-Hagerstown, Maryland, region.

Morgantown epitomizes small-town America, with two important differences: it is home to a major modern university, and some of the panoramic views of the West Virginia mountains are awe-inspiring. A few of the city streets are incredibly steep and crooked as they wind over and around the hills, but it's also incredibly difficult to find a real traffic jam. The city's central shopping area offers the diversity usually found only in a metropolitan shopping mall; Morgantown's mall contains the standard national chains and franchises.

Morgantown's heritage draws on both the industrial north and the more leisurely south. The push of the work ethic is modified and gentled by the knowledge that there is ample time to be friendly and polite. Since the city sits in the middle of some of the world's finest coal deposits, that too is a part of the heritage. Today, the University is the area's largest employer, and its intellectual and cultural atmosphere has generally permeated that of the town.

Geographically, Morgantown is a secluded crossroads. Washington, D.C., is a four hour drive to the east; Pittsburgh, PA is an hour and a half to the north. To the west lie the cities along the Ohio River. And to the south is all of wild, wonderful West Virginia, from the Greenbrier at White Sulphur Springs and the National Radio Astronomy Laboratory at Greenbank to the ski resorts and national and state forests. The interstate highway system, a commuter airline connecting with national carriers, and the ubiquitous computer terminal combine to let individuals choose how much or how little of the rest of the world will intrude on theirs.

Because of WVU's intellectual resources, the Morgantown area is a major research center in the Appalachian region. Four federal agencies have research facilities in the area—Department of Health and Human Services (Appalachian Laboratory for Occupational Safety and Health), Forest Service (Forestry Sciences Laboratory),

Morgantown Energy Technology Center of the U.S. Department of Energy, and Soil Conservation Service (West Virginia headquarters).

West Virginia University has two campuses, primarily because it has outgrown the space available in the city. The in-town campus has a Victorian look, with ivy walls and shady walks. The Evansdale campus, where the Health Sciences Center and the College of Agriculture and Forestry, the College of Creative Arts, the College of Engineering, the College of Human Resources and Education, the Law School, the College of Mineral and Energy Resources, the School of Physical Education, and the School of Social Work are located, has no buildings over 25 years old. The gap between the campuses is bridged by the rapid transit system, referred to always as the PRT. University residence halls and apartments are adjacent to the PRT, and privately owned apartment complexes allow students to live in quarters that stylistically range from generic modern to Victorian rococo.

Of the nearly 20,000 students enrolled on the Morgantown campuses, most undergraduates are housed in the University-owned residence halls, and many married students and single graduate students live in University apartments. Approximately 3,000 students live in privately owned residence halls and fraternity and sorority houses; many commute from their parents' homes, and the rest live in apartments, mobile homes, and private rooms.

The University Housing and Residence Life Office, G-18 Towers (phone 304-293-2811), provides information concerning University-owned housing. The student life office in Moore Hall provides information concerning privately owned, off-campus housing (phone 304-293-5611).

Listings for privately owned rentals change daily so students should visit the Office of Student Life to see what is available and make their own arrangements with landlords. Good housing is plentiful, both in residence halls and private apartments. Because of the hilly terrain, parking is limited on the WVU campuses and in the city.

The West Virginia University Libraries contain over 1.5 million volumes and 1.4 million microforms. Some 30,000 volumes are added each year, and 9,000 periodical titles are received.

The collections are especially strong in the biological sciences, chemistry, engineering, economics, Africana, the southern Appalachians, and West Virginia history. Facilities for research in West Virginia and regional history are centered in the West Virginia Collection, on the second floor of Colson Hall. In addition to an extensive collection of books, periodicals, and maps, the West Virginia Collection contains over three million manuscripts. These, together with court records from many counties, are invaluable sources for the study of all aspects of West Virginia history.

The rare book room contains an unusually fine collection of first and limited editions, including four Shakespeare folios and first editions of many of the works of Dickens, Scott, and Clemens.

The Evansdale Library houses the collections needed to support the schools and colleges on the Evansdale Campus: Agriculture, Engineering, Human Resources and Education, Social Work, Physical Education, and Creative Arts.

Housing and Residence Life

Library Services

Computing Services

The Health Sciences Center library on the second floor of the Basic Sciences Building contains over 150,000 volumes with a complete public catalog. Author cards for titles in the health sciences center library appear in the main library catalog.

The law library, with a collection of over 130,000 volumes, is in the Law Center on the Evansdale Campus.

The mathematics library in Eiesland Hall contains approximately 16,000 volumes.

The music library in room 424-A, Creative Arts Center, contains some 23,000 items, including microcards, microfilms, recordings, books, and scores.

Audiovisual departments are in Colson Hall and the Health Sciences Center library. A catalog of all audiovisual holdings is available at both locations and at the various libraries.

The University community is served by two computer organizations: West Virginia University Computing Services and West Virginia Network for Educational Telecomputing (WVNET). WVNET provides hardware and software for all colleges and schools in the state. WVU Computing Services coordinates these resources and provides additional services on the WVU campuses.

WVNET hardware includes an IBM 3081KX with 48 megabytes of real memory, an IBM 3081D with 16 megabytes of real memory, and a Digital Equipment VAX 8650 (48 megabytes), a VAX 8550 (48 megabytes), and an 11/780 (16 megabytes) in a VAX cluster for a total of five gigabytes of on-line disk space. Direct access for the IBM systems are from a dual density 3380E disk drive and from twelve STC 8380s. The disk drives for the Digital Equipment units are RA81s. Tape drives are STC 3420 model 6; WVNET supports 6250 and 1600BPI recording densities. Printers include three STC IMPACT 1500s, an IBM 3820 laser, a Zeta 3600X plotter, and an assortment of microfilm/fiche processors and duplicators.

A wide range of software is available for both the IBM and DEC hardware. Programming languages include COBOL, FORTRAN, PL/1, Ada, BASIC, C, and Pascal. Software for specific academic disciplines include the International Mathematical and Statistics Library, the North Carolina State Statistical Analysis System, the UCLA Biomedical Package, the University of Chicago's Statistical Package for the Social Sciences, the Standford Public Information Retrieval System, and forms of special purpose engineering software.

The University maintains access sites for WVNET at a number of places on campus. Batch processing/remote job entry and time sharing sites are open every day except Sunday. Exact hours and documentation libraries are available at each site. User consultants are at the Evansdale Library and Colson Hall sites to answer questions and help with problems.

WVU Computing Services publishes *Output*, a newsletter, and *Computing at WVU*, a user's guide.

Part 4

GRADUATE PROGRAMS AND COURSES

Plan for Numbering Courses

For convenience, each course is designated by an acronym for the department in which it is given and by a number particular to that course. The plan for numbering is as follows:

Courses 200 to 299—Courses for advanced undergraduate students and selected graduate students. No more than 40 percent of the credits counted for meeting requirements for a graduate degree can be at the 200 level.

Courses 300-399—Courses for graduate students; students in professional programs leading to the doctorate; and selected, advanced undergraduates. Undergraduates in any class carrying a 300-level course number must have a 3.0 cumulative grade-point average and have written approval on special forms from their instructors and advisers. Seniors within 12 semester hours of graduation may, with prior approval of their advisers, enroll in 300-level graduate courses for graduate credit. (In summary, 200-level courses are intended primarily to serve undergraduate students; 300-level courses are intended primarily to serve introductory graduate and master's degree course needs.)

Courses 391 (Advanced Topics) and 397 (Master's Degree Research or Thesis)—Courses are approved for University-wide use by any academic unit. These courses may be graded S or U.

Courses 400 to 499—Courses for graduate students only. All doctoral degree dissertation hours shall be awarded at the 400-level—specifically under course number 497. Courses numbered 497 may be graded S or U.

Courses 492 to 495—Courses are approved by the Assistant Vice President for Curriculum and Instruction. Approved requests are forwarded to the Office of Admissions and Records for entry into the WVU Schedule of Courses.

Graduate degree credit-hour requirements must include at least 60 percent at the 300 and 400 level.

Abbreviations Used in Course Listings

I — a course given in the first semester

II — a course given in the second semester

I, II — a course given in each semester

I and II — a course given throughout the year

Yr. — a course continued through two semesters

S. — a course given in the summer

hr. — credit hours per course

lec. — lecture period

rec. — recitation period

lab. — laboratory period

Conc. — concurrent registration required

PR — prerequisite

Coreq. — corequisite

Consent — consent of instructor required

CR — credit, but no grade

Schedule of Courses

Before the opening of semesters and summer sessions, a *Schedule of Courses* is printed to announce the courses that will be offered by the colleges and schools of WVU. Courses in this catalog are subject to change without notice.

ACCOUNTANCY, PROFESSIONAL

Jay H. Coats, Director of Graduate Programs

333 Business and Economics Building

*College of Business and Economics, West Virginia University, P.O. Box 6025,
Morgantown, WV 26506-6025*

Telephone: (304) 293-5408

Degree Offered: Master of Professional Accountancy

Graduate Faculty: Members G. Smith and Coats. Associate Members Maust, Neidermeyer, Pariser, Pushkin, Shastri, Shaw, and Titard.

The objective of the Master of Professional Accountancy (M.P.A.) degree is to provide the student with professional competence in accounting and executive level business education, including a broad understanding of the managerial process. The American Institute of Certified Public Accountants (AICPA) has stated that a C.P.A. candidate should have 150 semester hours of formal education in order to be prepared to cope with the increasingly complex nature of accounting practice. In addition, a five-year accounting education will become a requirement for membership in the AICPA beginning in 2000. Many states have passed, or are considering passing, legislation requiring C.P.A. candidates to have completed a fifth year of education before receiving permission to sit for the examination. The additional accounting education also aids a student in successfully preparing for any of the professional accounting examinations (C.P.A., C.M.A., C.I.A.), and students are encouraged to take these examinations while in the M.P.A. program.

The majority of the M.P.A. graduates have accepted employment in public accounting; the remainder have entered doctoral programs in accounting, industrial accounting, governmental accounting, or college teaching. A large number of employers visit the campus and offer access to the national job market.

Financial aid in the form of graduate assistantships and tuition scholarships is available to qualified students on a competitive basis. Most graduate assistants will have the opportunity to teach accounting principles. Graduate students are also eligible for the following awards:

The Harmon/Witschey Award: To honor an accounting graduate student in memory of Robert E. Witschey.

The Deloitte Haskins & Sells Award: To honor a graduate student in accounting who has demonstrated outstanding academic performance.

The M.P.A. program at WVU follows the 150-hour recommendation of the AICPA, as published in its report entitled *Education Requirements for Entry into the Accounting Profession*. The College of Business and Economics is fully accredited by the American Assembly of Collegiate Schools of Business.

The graduate courses leading to the M.P.A. degree are intended to be completed in one calendar year of full-time studies. The program requires that the student have an undergraduate degree with a minimum of 24 hours in accounting. Work experience is not a requirement for admission. Students may enter the program on either a full-time or part-time basis in any semester, but fall is the preferred starting date. Careful selection of degree candidates limits the size of classes, leads to high quality efforts in the program, and permits frequent and direct contact between students and faculty.

To obtain approval for entry into the M.P.A. program an applicant must have a baccalaureate degree from an accredited college or university and an undergraduate grade-point average of at least 3.0 overall or in the last 60 credit hours taken. The student must also have an accounting grade-point average of at least 3.0. In addition, the applicant must submit a score of 500 or

above on the Graduate Management Admission Test (GMAT). Applicants with a GPA below 3.0 (or GMAT scores below 500) must show correspondingly higher GMAT (or GPA) achievement.

To assure that all students in the program have the same foundation in business, the following prerequisite courses, or their equivalent, must be completed before enrolling in M.P.A. graduate courses: principles of accounting (6 hours), intermediate accounting (6 hours), advanced accounting, cost accounting, tax accounting, auditing, principles of economics (6 hours), principles of marketing, principles of management, principles of finance, production management, statistics, business law, business policy, and management information systems.

A student without the necessary prerequisite courses may be approved to enter the M.P.A. program as a provisional graduate student. All applications for approval to enter the M.P.A. program must be received in the WVU Office of Admissions and Records as early as possible and no later than one month before the date for which enrollment is requested.

Master of Professional Accountancy (M.P.A.)

The candidate's program will be planned with the assistance and approval of the Director of Graduate Programs. The M.P.A. degree requires 39 hours of graduate credit and is normally completed in one calendar year. The program of study is as follows:

Fall Semester

- Accounting 325 Accounting Information Systems
- Accounting 330 Financial Accounting Theory and Practice
- Accounting 333 Income Taxes and Business Decisions
- Management 303 Introduction to Management Science
- Speech Pathology and Audiology 280 Oral/Written Skills for Professionals

Spring Semester

- Accounting 335 Computer Systems Auditing
- Accounting 338 Controllership
- Economics 318 Economic Policy
- Finance 321 Corporate Financial Administration
- Elective Course

Summer I

- Accounting 332 Governmental and Nonprofit Accounting
- Accounting 340 Reporting Practices and Problems
- Accounting 345 Auditing and Professional Accounting Standards
- Elective Course

No thesis is required in the program, but communication skills are emphasized in all courses. Extensive use is made of microcomputers in accounting applications.

The M.P.A. program requires that the student maintain a grade-point average of at least 3.0 on all work taken as a graduate student while enrolled in the College of Business and Economics, including prescribed work taken to remove undergraduate deficiencies. A student whose cumulative grade-point average falls below 2.75 will be placed on probation. If the average is not brought up to 2.75 by the end of the following semester, the student will be suspended from the program. A grade below C in any course taken while enrolled as a graduate student will result in suspension from the graduate program.

Complete information about the M.P.A. program may be obtained by contacting the Director of Graduate Programs.

Accounting (Acctg.)

200. *Special Topics.* S. 1-4 hr. PR: Acctg. 111 or consent. Special topics relevant to accounting. (Maximum of nine semester hours in any or all courses numbered 200 offered by the College may be applied toward bachelor's and master's degrees.)
211. *Accounting Systems.* 3 hr. PR: C.S. 5, Acctg. 112 or consent. Analysis of data-processing fundamentals and information systems analysis, design, and implementation, including necessary computer hardware and software components with particular reference to accounting information systems and the controls necessary therein.
213. *Income Tax Accounting.* 3 hr. Conc.: Acctg. 111 or 116 or consent. Overview and survey of Federal income tax principles for individuals and simple corporations with emphasis on gross income, exemptions, deductions, capital gains and losses, and tax credits.
214. *Income Tax Accounting.* 3 hr. PR: Acctg. 213 or consent. The study of Federal income tax treatment of partnerships, corporations and estates, and the treatment of those property transfers subject to the Federal Gift Tax, together with an introduction to tax research and tax procedure.
217. *Auditing Theory.* 3 hr. PR or Conc.: Acctg. 210 or consent. Auditing fundamentals; objectives, ethics, statistical samplings, standards and procedures. Emphasis on FASB and SAS disclosures.
325. *Accounting Information Systems.* 2 hr. PR: Consent. The design and use of computerized accounting information systems to support the transaction processing, reporting and decision-making systems of most organizations, including the use and critical analysis of currently available accounting packages.
330. *Financial Accounting Theory and Practice.* 3 hr. PR: Acctg. 112. Comprehensive examination of financial accounting theory as established by the opinions, statements and interpretations of professional organizations with special emphasis on their application and problem solving.
332. *Governmental and Nonprofit Accounting.* 3 hr. PR: Acctg. 112. Fund accounting and control in governmental and nonprofit entities; identification and control of cost centers; cost analysis and cost centers; cost analysis and cost finding, and planning and control of operations and resources.
333. *Income Taxes and Business Decisions.* 3 hr. PR: Acctg. 213. Advanced federal income-tax problems with emphasis on tax planning for business decisions and tax research methodology.
335. *Computer Systems Auditing.* 2 hr. PR: Acctg. 325. The analysis and design of control systems in a computerized accounting environment. Special emphasis on evaluating evidence to determine whether a computing system safeguards assets and maintains data integrity.
338. *Controllership.* 3 hr. PR: Manag. 304. Examination of the role of the controller in large entities in planning, measuring, evaluating, and controlling performance and in reporting to stockholders and governmental agencies.
340. *Reporting Practices and Problems.* 3 hr. PR: Consent. Evaluation of financial reporting practices and trends, including an examination of the reporting requirements of the SEC and other regulatory agencies. Practitioners will be used extensively for class discussion and presentations.

345. *Auditing and Professional Accounting Standards.* 3 hr. PR: Acctg. 217. Professional objectives, principles, and standards of auditing; audit reports and related communications; and cash studies of audit sampling, professional ethics, legal liability and reporting.

349. *Seminar.* 3 hr. PR: Consent.

491. *Advanced Study.* 1-6 hr.

AGRICULTURAL BIOCHEMISTRY

William G. Martin, *Program Chairperson*
1022 Agricultural Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Brooks, Hoover, Ingle, Martin, Reid, and Stelzig. Associate Members Kaczmarczyk and Ulrich.

The interdivisional program of agricultural biochemistry of the College of Agriculture and Forestry offers graduate studies leading to the degree of master of science. Each student selects and conducts research in the broad areas of biochemical genetics, nutritional biochemistry, or plant biochemistry. The research project selected by the student represents the base upon which the graduate program is built.

The objective of the agricultural biochemistry graduate program is to prepare the student for a career in biochemistry in agricultural, biological, food and veterinary medical sciences. Each student, in concert with the adviser and graduate committee, will design the student's research program at the beginning of the first semester. The student and adviser then prepare the research proposal which, when approved by the graduate committee, will become the distinguishing feature of the program and, when completed, will provide the data for the thesis or dissertation.

In addition to meeting the admission requirements, students must have an overall grade-point average of at least 2.5 in general, and analytical, organic, and physical chemistry. Deficiencies in these courses may be removed during the first year of graduate enrollment if prior consent is obtained from the agricultural biochemistry faculty. Courses in biology and physiology are beneficial, though not required, for admission.

Master of Science

The master of science (M.S.) degree in agricultural biochemistry combines the academic and research programs of the student, yielding a biochemist prepared for a career in agricultural, biological, food, or veterinary medical sciences. The academic program is composed of graduate courses and selected supporting courses in genetics, physiology, nutrition, or plant sciences. The student will be advised by a committee of three or more faculty. Thirty hours of graduate credit is required for the degree, of which no more than six hours may be for research. The research program terminates with a thesis which is presented to the graduate committee and defended in a comprehensive examination. Students interested in study leading to the Ph.D. degree should apply for acceptance into the Ph.D. program in Agricultural Sciences.

Agricultural Biochemistry (Ag. Bi.)

210. *Introductory Biochemistry. I, II, S.* 3 hr. PR: 8 hr. General chemistry, Chem. 131 or equiv. Introduction to the chemistry of cellular constituents (proteins, amino acids, carbohydrates, lipids, nucleic acids, enzymes and coenzymes) and their metabolism in animals and plants.

211. *Introductory Biochemistry Laboratory.* I. 1 hr. Conc.: Ag. Bi. 210. Experiments to demonstrate certain principles and properties of animal and plant biochemicals.

212. *Nutritional Biochemistry.* II. 3 hr. PR: Ag. Bi. 210 or consent. Nutritional biochemistry of domestic animals.

213. *Nutritional Biochemistry Laboratory.* II. 1 hr. PR: Ag. Bi. 210, 211; Conc.: Ag. Bi. 212. Experiments to determine the nutritional constituents in animal and plant tissues.

310. *General Biochemistry.* I. 4 hr. PR: 8 hr. organic chemistry. The first half of a general course of biochemistry designed for graduate students of biological sciences. The course emphasizes the chemical properties of cellular constituents.

311. *Laboratory Experiments in Biochemistry.* I. 2 hr. PR or Conc.: Ag. Bi. 310. Experiments designed to demonstrate some of the basic tools and procedures of biochemical research.

312. *General Biochemistry.* II. 4 hr. PR: Ag. Bi. 310 or consent. The second half of a general course of biochemistry designed for graduate students of biological sciences. The course emphasizes reactions and control of intermediary metabolism.

414. *Enzymes.* II. 3 hr. PR: Ag. Bi. 312 or consent. A survey of enzymology covering general principles as well as current concepts and methods.

415. *Advanced Biochemistry Laboratory.* II. 2 hr. PR or Conc.: Ag. Bi. 312. Experiments in the areas of intermediary metabolism and enzymology.

416. *Vitamin and Coenzyme Biochemistry.* II. 2 hr. PR: Ag. Bi. 312, or Bioch. 231, or consent. Chemical and physical properties, analysis, biosynthesis, metabolism, pathobiology, pharmacology, and toxicology of vitamins, vitamin-like compounds, and coenzymes. (Offered in Spring of odd years.)

422. *Plant Biochemistry.* I. 3 hr. PR: Ag. Bi. 312 or consent. Advanced treatment of the composition and metabolism of plants. Topics include cell wall structure, sulfur and nitrogen metabolism, and photosynthesis. (Offered in Fall of odd years.)

424. *Advanced Nutritional Biochemistry.* I. 4 hr. PR: Ag. Bi. 310, 311, 312 or consent. Advanced treatment of the biochemistry and metabolism of amino acids, carbohydrates and lipids in the diets of ruminants and nonruminants. (Offered in Fall of even years.)

428. *Biomembranes and Muscle Biochemistry.* II. 3 hr. PR: Ag. Bi. 312, or Bioch. 231, or consent. Chemical, organization, and physiological aspects of membranes and muscles; molecular and cellular interactions and integrative mechanisms. 3 hr. lec. (Offered in Spring of even years.)

450. *Seminar.* I, II. 1 hr. per sem.

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigations of biochemistry in animal and plant systems. Study may be independent, with staff approval, or through specially scheduled lectures.

496. *Seminar.* I, II. 1 hr. per sem. Presentation and discussion of current topics in agricultural biochemistry, membrane biophysics, and biochemical genetics.

497. *Research.* I, II, S. 1-15 hr. Research in biochemical genetics, nutritional biochemistry, or plant biochemistry under staff supervision for agricultural biochemistry majors.

NOTE: See other courses listed under "Biochemistry."

AGRICULTURAL ECONOMICS

Virgil J. Norton, Chairperson of Division of Resource Management

2018 Agricultural Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Collins, Colyer, D'Souza, Fletcher, Jack, Phipps, and Smith. Associate Members Barr, Ferrise, McIntosh, and Yoder.

Master of Science (M.S.)

The Master of Science in agricultural economics provides advanced training in the areas of agricultural, resource, and rural development economics. The degree prepares students for further graduate study and a wide variety of careers in business and government.

Faculty in agricultural economics cooperate with faculty in the Department of Mineral and Energy Economics in the College of Mineral and Energy Resources to offer course work and joint research projects appropriate for students in both programs. Graduate students may select faculty from both programs to serve on their thesis committee. Such cooperation strengthens the teaching and research of both programs and offers graduate students a wider range of selection of coursework and thesis issues as well as opportunities for interaction among graduate students in the two programs.

Requirements for Admission

Students seeking a Master of Science with emphasis in agricultural economics may be accepted for graduate study on a regular or provisional basis. The Admissions Committee reviews and evaluates all applications.

In addition to meeting general requirements, students must have:

1. Twelve or more semester credits in economics, agricultural economics, statistics, or appropriate social science courses (should include principles of economics).
2. Three or more semester hours of credit in calculus. (May be made up after admission but not for graduate credit.)
3. A grade-point average of 2.75 for all credit in economics and agricultural economics.

Options and Plan of Study

A thesis or course work option may be selected. Students should select the option by the time 12 hours of course work are completed and after consulting with their graduate committees. Candidates with graduate research assistantships should select the thesis option.

Thesis Option. A minimum of 30 credit hours of approved work to include not more than six hours of credit for the thesis, and enough courses to provide proficiency in economics and agricultural economics. Courses in closely related social sciences may be included. The student's graduate committee must approve the student's course of study and thesis topic.

Course Work Option. A minimum of 36 credit hours of approved course work to provide proficiency in economics and agricultural economics. Courses in closely related social sciences may be included if approved by the student's graduate committee.

Plan of Study. Candidate's plans of study are developed by students in consultation with their major professors and graduate committees. Normally, the plan of study will include graduate-level courses in economic theory, statistics, and agricultural economics. The plan of study should be developed during the first full term of study.

Standards of Achievement

A minimum grade-point average of 3.0 is required for all graduate credit courses taken as part of the approved program for the degree. This includes graduate credit transferred and graduate credit accumulated while pursuing a degree in agricultural economics. Persons requesting transfers of graduate credit must obtain approval of their graduate committee for such transfers.

Examinations

Thesis Option—Satisfactory completion of an oral examination and, at the discretion of the student's graduate committee, a written examination.

Course Work Option—Satisfactory completion of a written and an oral examination.

Agricultural Economics (Ag. Ec.)

200. *Land Economics*. II. 3 hr. Classification, development, tenure, use, conservation, valuation, and taxation of rural, urban, mineral, forest, water, and recreational land resources. Private and public rights in land and the effect of population on the demand for land.
206. *Farm Planning*. I or II. 3 hr. PR: Ag. Ec. 104 or consent. Planning use of labor, soil, crops, livestock, buildings and equipment; principal factors influencing returns on farms. (Farm visits required.)
211. *Rural Economic Development*. I or II. 3 hr. Resource utilization, economic behavior and economic systems and subsystems, trade, public revenue and its allocation, distribution of income, manpower problems, development policies, and regionalization in rural areas.
220. *Agricultural Cooperatives*. II. 3 hr. History, principles, organization, management, taxation and legal aspects of agricultural marketing, supply, and service cooperatives in the U.S. economic system.
231. *Marketing Agricultural Products*. I or II. 3 hr. Market organization, policies, practices, and factors affecting the marketing of agricultural products. (Tour of market agencies and facilities required.)
235. *Marketing Dairy Products*. II. 2 hr. Milk-marketing policies and practices, including milk-market orders.
240. *Agricultural Prices*. I. 3 hr. Analysis of price-making forces which operate in the market places for the major agricultural commodities.
261. *Agribusiness Finance*. II. 3 hr. Credit needs for agricultural businesses, financing farm and market-agency firms, and organization and operation of credit agencies which finance agricultural business firms.
271. *Agricultural Policy*. I or II. 3 hr. Examination of economic aspects of governmental price programs, production and marketing controls, subsidies, parity, export and import policies, and other programs affecting agriculture.
342. *International Agricultural Economic Development*. I. 3 hr. Current problems, theories, policies, and strategies in planning for agricultural and rural development for increased food production and to improve the well-being of rural people in the developing countries of the world.
343. *Agricultural Project Analysis and Evaluation*. II. 3 hr. PR: Consent. Design, analysis, and evaluation of development projects; economic and financial aspects of project analysis; identification and measures of comparing projects costs and benefits; preparation of feasibility reports.

355. *Resource Analysis.* I. 3 hr. PR: Senior standing. Construction of models consistent with economic reality for allocating the factors of production available on farms, in forests, and in nonfarm agricultural businesses to produce profit maximizing plans through use of linear and dynamic programming and electronic equipment.

431. *Advanced Agricultural Marketing.* I or II. 3 hr. PR: Consent. Structure of agricultural marketing; economic theory as applied to agricultural marketing with emphasis on theoretical and practical applications.

440. *Advanced Farm Management.* I. 3 hr.

441. *Production Economics.* I or II. 3 hr. PR: Consent. Economic principles of production with special application to agriculture.

Resource Management (Res. M.)

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent.

496. *Graduate Seminar.* I, II, S. 1 hr. PR: Consent.

497. *Research.* I, II, S. 1-15 hr.

AGRICULTURAL EDUCATION

Virgil J. Norton, Chairperson of Division of Resource Management

2018 Agricultural Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Gartin, Lawrence, and Odell. Associate Member Maxwell.

The agricultural education faculty offers master's programs for persons desiring advanced study in teaching vocational agriculture or in agricultural extension education. Candidates for the Master of Science degree in agricultural education may be admitted on a regular or provisional basis. A student who does not have a B.S. in Agriculture with a major in agricultural education may be required to complete undergraduate courses in agriculture and professional education which are prerequisites to essential graduate courses.

Students shall combine graduate courses in agriculture and professional education by taking 16 to 20 hours in agriculture and 10 to 14 hours in education. Programs are planned to ensure that candidates develop an understanding of:

- The teaching/learning process.
- The design and operation of instructional programs in agriculture.
- Research and evaluation processes.
- The philosophy and purposes of public agricultural education.

All graduate courses offered toward the degree must be approved by the student's adviser. A thesis is required as a part of the 30-hour graduation requirement.

Agricultural Education (Ag. Ed.)

260. *Principles of Cooperative Extension.* I. 2 hr. PR: Consent. Background, philosophy, and history of cooperative extension. Activities of county cooperative extension agents and cooperative extension programs in West Virginia.

261. *Methods and Materials in Extension Education.* II. 2 hr. PR: Consent. Organization and preparation for extension teaching and the processes of communication. (Offered in Spring of odd years.)

263. *Teaching Young, Adult Farmer, and Off-Farm Agricultural Occupations Classes.* I. 2 hr. PR: Ed.P. 105, 106 or consent. Participation in conducting young farmer, adult farmer, and off-farm agricultural occupations classes; organization, course of study, method in teaching, and supervision of classes, young farmers' associations, adult farmers' organizations and off-farm agricultural occupations organizations. (Also listed as C&I 263.)

264. *Cooperative Vocational Education.* II. 4 hr. PR: Consent. Preparation for planning, organizing, and conducting high school programs of cooperative vocational education, and familiarization with business organization and operation. (Also listed as C&I 264.)

362. *Program Building in Cooperative Extension.* II. 3 hr. PR: Consent. Organization in relation to program building. Leadership and group action. Overall working and educational objectives, principles, method, and goals in developing county extension programs. (Offered in Spring of even years.)

364. *Organizing and Directing Supervised Farming and Supervised Occupational Experience Programs.* S. 2 hr. PR: Ag. Ed. 160 or consent. Planning programs of supervised farming and supervised occupational experience; supervising and evaluating such programs for day students, young farmer, adult farmer, and off-farm agricultural occupations classes and groups. (Also listed as C&I 364.)

460. *Planning Programs and Courses for Vocational Agriculture Departments.* S. 2 hr. PR: Ag. Ed. 160, 188. Gathering data, studying farming and off-farm agricultural occupations problems of day students, young farmers, adult farmers, and off-farm agricultural occupational groups and formulating total programs for school communities. (Also listed as C&I 460.)

492. *Seminar.* I, II, S. 1-3 hr. Overview and analysis of problems, literature, and research in agricultural education.

Resource Management

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent.

496. *Graduate Seminar.* I, II, S. 1 hr. PR: Consent.

497. *Research.* I, II, S. 1-15 hr.

AGRICULTURAL MICROBIOLOGY

Alan J. Sexstone, *In Charge of Graduate Program in Agricultural Microbiology*
401 Brooks Hall

Degree Offered: Master of Science

Graduate Faculty: Members Bissonnette, Hindal, Morton, and Sexstone. Associate Member Anderson.

The graduate curriculum in agricultural microbiology in the College of Agriculture and Forestry places emphasis on the interrelationships of microorganisms and their environments. Study leading to the M.S. degree is designed to prepare students with specialization in microbiology as applied to soil, water, wastewater, agriculture, and food.

The teaching and research faculty have special interests in the areas of environmental microbiology, biotransformation of environmental pollutants, pollution abatement, public health and sanitary aspects of aquatic, terrestrial, and food environments, and the general microbial ecology of such environments.

Graduate training is designed to offer qualified students a broad background in the environmental sciences through cooperation with other disciplines in the College of Agriculture and Forestry, College of Arts and Sciences, College of Engineering, and School of Medicine. A thesis is required.

Students interested in the doctoral degree should apply for acceptance into the program leading to the Ph.D. in Agricultural Sciences.

Agricultural Microbiology (Ag. Micro.)

201. *Environmental Microbiology.* II. 4 hr. PR: Ag. Micro. 141 or consent. Microbiology as applied to soil, water, wastewater, sewage, air, and the general environment. Occurrence, distribution, ecology, and detection of microorganisms in these environments.
347. *Food Microbiology.* I. 4 hr. PR: Ag. Micro. 141 and Ag. Bi. 210, or consent. Ecology and physiology of microorganisms important in the manufacture and deterioration of foods. Techniques for the microbiological examination of foods. (Offered in Fall of odd years.)
348. *Sanitary Microbiology.* I. 3 hr. PR: Ag. Micro. 141 or consent. Microbiology and health hazards associated with food handling, water treatment, and sanitary waste disposal. (Offered in Fall of even years.)

Plant Science (Pl. Sc.)

420. *Special Topics.* I, II, S. 1-6 hr. Special study in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.
450. *Seminar.* I, II. 1 hr. Graduate seminar in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.
497. *Research.* I, II, S. 1-15 hr. Graduate research in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

AGRICULTURAL SCIENCES

Robert H. Maxwell, *Dean of the College of Agriculture and Forestry*

1170 Agricultural Sciences Building

Degree Offered: Doctor of Philosophy

Graduate Faculty: Members Amrine, Baker, Balasko, Baugher, G. K. Biggs, Bissonnette, Brooks, Bryan, Butler, Colyer, Dailey, Diener, D'Souza, Elliott, Gartin, Hindal, Hogmire, Hoover, Ingle, Inskeep, Jack, Keefer, Klandorf, Kotcon, Kvashny, Lawrence, Lerner, Lewis, MacDonald, Martin, McCurley, Morton, Nath, Odell, Oscar, Peterson, Popenoe, Prigge, Reid, Russell, Sencindiver, Sexstone, Singh, Singha, Skousen, D. K. Smith, Stelzig, Weaver, and R. J. Young. Associate Members Anderson, D. R. Armstrong, Baniecki, Barr, Bearce, Collier, Collins, Dozsa, Ferrise, Horvath, Jencks, Jordan, Kaczmarczyk, Karther, Koes, Longenecker, Maxwell, McBride, McIntosh, Osborne, Peterson, P. M. Smith, Sperow, Ulrich, Wagner, van Eck, Yoder, Yuill, and Zimmerman.

Doctor of Philosophy in Agricultural Sciences

The College of Agriculture and Forestry offers graduate studies leading to the degree of doctor of philosophy. This doctoral program offers two options: Animal and Food Sciences, and Plant and Soil Sciences. Students entering this program may select research and classes to emphasize agricultural microbiology, agronomy, animal nutrition, entomology, horticulture or plant pathology. The objective of the degree program is to provide doctoral students an opportunity to study and conduct research with faculty in areas of excellence within the college. Research and training in the various disciplines are under four major areas of emphasis in the college: forage-livestock production; improvement and protection of soil, plants, and water; food and nutritional sciences; and resource development.

Prospective graduate students initiate application for admission on forms available from the university Office of Admissions and Records. The completed forms should be returned to the Office of Admissions and Records,

accompanied by payment of the non-refundable special service fee. An official transcript from all colleges attended in the course of an applicants' masters and undergraduate degree must be part of the application for admission. A student must hold a master's degree or equivalent to be eligible for admission into this program.

The following admission and performance standards are normally required in the doctor of philosophy in agriculture sciences program:

a. An applicant must possess a master's degree and hold a grade-point average (GPA) of 3.0 or above (on a 4.0 scale) in postgraduate courses.

b. The Graduate Record Examination is required. For regular admission a minimum score of 1100 is expected.

c. A student whose native language is not English must have obtained a minimum score of 550 on the TOEFL examination.

d. An applicant must provide three letters of reference.

e. A one to two page letter of intent from the student describing his/her research and professional aspirations is required.

Students who do not meet the requirements, but have special qualifications or circumstances, may be admitted as provisional graduate students if approved by the Graduate Faculty Committee, Division Director and Doctoral Program Coordinator.

All students in the program must adhere to the following course requirements:

a. Core Courses—Doctoral students must satisfactorily complete a set of core courses before they will be admitted to candidacy for the Ph.D. degree. All core courses will be at the 300 or 400 level, except where indicated below. Certain course requirements may be waived if the student has received equivalent training in prior course work. Additional course work pertaining to the student's area of specialization will be determined by the student's major professor and graduate committee. Core courses are in the following areas:

Biological and Earth Sciences

A minimum of six credit hours of coursework must be completed in the biological or earth sciences (excluding courses within a student's major field of study).

Agriculture (Ag.)

200. *Agricultural Travel Course.* S. 1-6 hr. Tour and study of production methods in major livestock and crop regions of the United States and other countries. Influence of population, climate, soil, topography, markets, labor, and other factors on agricultural production.

360. *Problem Report for the Degree of Master of Agriculture.* I, II, S. 1-3 hr.

Animal and Veterinary Science (A&VS)

420. *Special Topics.* I, II, S. 1-4 hr. (1 hr. credit in special cases only). Advanced study in particular phases of such animal science topics as animal production, nutrition, physiology, breeding and genetics, veterinary science, and food. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; max. credit, 6 hr.).

491. *Advanced Study.* I, II, S. 1-6 hr.

497. *Research.* I, II, S. 1-15 hr. Research in animal nutrition, physiology, breeding and production, and veterinary science.

Animal Nutrition (An. Nu.)

430. *Rumen Metabolism and Physiology*. I. 3 hr. PR: Course in biochemistry. The anatomy and physiology of the forestomachs of ruminants and the rumen microbial population. Emphasis on the microbial metabolism as it pertains to the utilization of feeds by ruminants. (Offered in Fall of odd years.)

432. *Forage Chemistry and Quality*. 3 hr. PR: An. Nu. 301 and Agron. 254, or consent. Advanced course in chemistry and biochemistry of pastures and forages, emphasizing factors affecting their quality and principles governing their utilization by herbivorous animals. (Also listed as Agron. 432.) (Offered in Spring of even years.)

434. *Mineral Nutrition of Animals*. II. 3 hr. PR: An. Nu. 301 or consent. Mineral nutrition of livestock and man; soil-plant-animal interactions. Detailed treatment of function of individual elements and their involvement in deficiency and toxicity conditions on an international basis. (Offered in Spring of odd years.)

450. Seminar. I, II. 1 hr.

491. *Advanced Study*. I, II, S. 1-6 hr. (Repeat registration permitted for maximum of 6 credit hours per year.) Topics in advanced nutrition. Subject will be selected by staff for formal presentation.

Animal Physiology and Breeding (An. Ph.)

425. *Endocrinology of Reproduction*. II. 4 hr. (2 labs.). PR: An. Ph. 225 or Biol. 268 or equiv. Discussion of and laboratory experience in classical and current concepts of hormonal and neurohormonal regulations of reproductive phenomena with emphasis on species differences and similarities. (Offered in Spring of odd years.)

426. *Advanced Animal Selection*. II. 3 hr. PR: Course in statistics and course in genetics or equiv. An advanced course dealing with the basic concepts of experimental and statistical approaches in the analysis of quantitative inheritance with special reference to the magnitude and nature of genotypic and nongenotypic variability. (Offered in Spring of even years.)

450. Seminar. I, II. 1 hr.

Animal Production (An. Pr.)

422. *Advanced Milk Production*. II. 3 hr. PR: An. Nu. 101 or consent. Advanced study of the feeding, breeding, and management of dairy cattle.

AGRICULTURE

Robert H. Maxwell, *Dean of the College of Agriculture and Forestry*

1170 Agricultural Sciences Building

Degree Offered: Master of Agriculture

Graduate Faculty: Members Amrine, Baker, Balasko, Baugher, G. K. Biggs, Bissonnette, Brooks, Bryan, Butler, Colyer, Dailey, Diener, D'Souza, Elliott, Gartin, Hindal, Hogmire, Hoover, Ingle, Inskeep, Jack, Keefer, Klandorf, Kotcon, Kvashny, Lawrence, Lerner, Lewis, MacDonald, Martin, McCurley, Morton, Nath, Odell, Oscar, Peterson, Popenoe, Prigge, Reid, Russell, Sencindiver, Sexstone, Singh, Singha, Skousen, D. K. Smith, Stelzig, Weaver, and R. J. Young. *Associate Members* Anderson, D. R. Armstrong, Baniecki, Barr, Bearce, Collier, Collins, Dozsa, Ferrise, Horvath, Jencks, Jordan, Kaczmarczyk, Karther, Koes, Longenecker, Maxwell, McBride, McIntosh, Osborne, Peterson, P. M. Smith, Sperow, Ulrich, Wagner, van Eck, Yoder, Yuill, and Zimmerman.

M. Agr.

Students desiring this degree must obtain approval from the master of agriculture committee and meet the minimum admission requirements. The

committee charged with administering the degree program is appointed by the Dean of the College of Agriculture and Forestry. The student's baccalaureate degree should be in a field sufficiently related to the course of study contemplated to provide the necessary background. A student whose baccalaureate degree is in a field considered not sufficiently related to the study contemplated may be admitted as a regular or provisional student until specific requirements are met or the student may be admitted on the basis of evidence of satisfactory professional experience.

Requirements. Satisfactory completion of 36 hours of course work is required for this degree. The student will select a minimum of 27 hours from the course offerings of the three divisions in the College of Agriculture (Divisions of Animal and Veterinary Sciences, Plant and Soil Sciences, and Resource Management). A minimum of nine hours will be selected from the offerings of each division. No more than three hours of special topics or advanced study from each division may be counted towards the degree. A three-hour problem report may be included at the option of the student and the program committee.

The student may choose the additional courses from within the College of Agriculture and Forestry or from offerings of other colleges and schools of WVU. An overall grade-point average of 3.0 is required for graduate courses included as part of the approved program for the degree. Upon completion of the course work, each candidate must undergo a written and oral examination by the candidate's graduate committee.

The graduate committee of each candidate shall have one member of the administering committee as a member. This member shall not be the chairperson or student adviser.

AGRONOMY

Robert F. Keefer, *In Charge of Graduate Program in Agronomy*
1108 Agricultural Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Baker, Balasko, Bryan, Keefer, Sencindiver, and Singh.
Associate Members Jencks, Sperow, and van Eck.

Agronomy is customarily divided into crop sciences and soil sciences and deals with the problems in plant development and crop production and the properties and uses of soils.

Thesis problems in crop sciences are selected in forage production, forage quality, forage/livestock systems, grazing management, and brush and weed control in forage crops. In soil sciences, the problems are selected in the areas of pre-mining overburden analyses and minesoils properties, characteristics and utilization of sewage sludge, flyash and other soil amendments, and mineral nutrition of crops or other soils problems. Research problems change in response to needs of the state and region. Cooperative research with other units of WVU, and with research units in other states and overseas, are undertaken as the need and opportunity occurs.

Facilities for graduate research include several farms, greenhouses, growth chambers, modern laboratories, and specialized equipment.

The student must have a bachelor's degree from any approved college and an adequate background in the physical and biological sciences. Admission requirements are those of the College of Agriculture and Forestry. Additional

undergraduate work may be required according to the needs of the field of specialization of the student. The courses required for graduate study will vary depending on the crops and soils emphasis. They are developed in consultation with the student's adviser and advisory committee. Students interested in study leading to the Ph.D. degree should apply for acceptance into the Ph.D. program in Agricultural Sciences.

Agronomy (Crop Science) (Agron.)

251. *Weed Control.* I. 3 hr. PR: Pl. Sc. 52, Agron. 2, or consent. Fundamental principles of weed control. Recommended control measures for and identification of common weeds. 2 lec., 1 lab. (Offered in Fall of odd years.)
252. *Grain and Special Crops.* II. 3 hr. PR: Pl. Sc. 52, Agron. 2, or consent. Advanced study of methods in the production of grain and special crops. Varieties, improvement, tillage, harvesting, storage, and uses of crops grown for seed or special purposes. (Offered in Spring of even years.)
254. *Pasture and Forage Crops.* I. 4 hr. Pl. Sc. 52, Agron. 2, or consent. All phases of pasture and forage crop production, including identification, seeding, management, use, seed production, and storage of forage crops. (3 lec., 1 lab.)
325. *Forage Harvesting and Storage.* 3 hr. PR: Agron. 254, or consent. Advanced study of processes associated with harvesting and storage of forages. 3 hr. lec. (Offered in Fall of odd years.)
354. *Pasture Management and Utilization.* 3 hr. PR: Agron. 254 and An. Nu. 101, or consent. Advanced study of pastures and their management and utilization with emphasis on temperate species. 3 hr. lec. (Offered in Spring of odd years.)
374. *Tropical Grasslands.* 3 hr. PR: Agron. 254 and An. Nu. 101, or consent. Advanced study of tropical grasslands and their management and utilization in animal production. (Offered in Fall of even years.)
432. *Forage Chemistry and Quality.* 3 hr. PR: An. Nu. 301 and Agron. 254, or consent. Advanced course in chemistry and biochemistry of pastures and forages, emphasizing factors affecting their quality and principles governing their utilization by herbivorous animals. (Also listed as An. Nu. 432.) (Offered in Spring of even years.) (3 hr. lec.)

Agronomy (Soil Science) (Agron.)

210. *Soil Fertility.* I. 3 hr. PR: Agron. 2 or 10. Soil properties in relation to fertility and productivity of soils; scrutiny of essential plant nutrients; use of fertilizers and lime; evaluation of soil fertility.
212. *Soil Conservation and Management.* I. 3 hr. PR: Agron. 2 or 10. Using soil technology to solve soil management problems relating to cropping systems. Field diagnosis of soil problems stressed. (2 lec., 1 lab.)
230. *Soil Physics.* II. 3 hr. PR: Agron. 2 or 10. Physical properties of soils, water and air relationships and their influence on soil productivity. (2 lec., 1 lab.) (Offered in Spring of even years.)
255. *Reclamation of Disturbed Soils.* 3 hr. PR: Junior standing or above and consent. Pedologic definitions and principles will be applied to advance planning and analysis, handling and placement, reclamation and revegetation practices, and continuing use of disturbed soils resulting from mining and urbanization activities. (Field trip required.)

315. *Soil Genesis and Classification.* I. 3 hr. PR: Agron. 2 or 10. Origin and formation of soils. Study of soil profiles and soil-forming processes in field and laboratory. Principles of classification and techniques of soil mapping. 2 lec., 1 lab. (Saturday field trips required.) (Offered in Fall of even years.)

410. *Advanced Soil Fertility.* II. 3 hr. PR: Agron. 210, Biol. 169 or consent. Influence of soil chemical and physical properties on availability of plant nutrients; intensive study of individual plant nutrients and interactions of nutrients in soils and crops. (Offered in Spring of even years.)

416. *Soil Chemistry.* I. 3 hr. PR: Consent. Chemistry of soil development; chemical and mineralogical composition of soils; nature and properties of organic and inorganic soil colloids; cation and anion exchange phenomena; soil chemistry of macro- and micro-nutrients. (Offered in Fall of odd years.)

418. *Chemistry of Soil Organic Matter.* II. 3 hr. PR: Organic chemistry or consent. Chemical composition of soil organic matter studied in relation to its physico-chemical properties and humus formation. Methods involving extraction, fractionation, and purification of soil organic components examined. 2 lec., 1 lab. (Offered in Spring of odd years.)

421. *Identification of Clay Minerals in Soil.* II. 3 hr. PR: Physical chemistry or consent. Characterization of clay minerals is an important aspect in soils, geology, civil engineering, and related fields. Study of methods used in qualitative and quantitative identification of these secondary minerals in soils and rocks. 1 lec., 2 lab. (Offered in Spring of even years.)

451. *Seminar in Micropedology.* I. 2 or 3 hr. PR: Second-year graduate and consent. Principles of optical mineralogy and of the polarizing microscope as applied to the study of soil minerals and soil fabrics. (Offered in Fall of even years.)

Plant Science (Pl. Sc.)

420. *Special Topics.* I, II, S. 1-6 hr. Special study in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

450. *Seminar.* I, II. 1 hr. Graduate seminar in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

497. *Research.* I, II, S. 1-15 hr. Graduate research in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

ANATOMY

Richard C. Wiggins, Chairperson of the Department

4052 Health Sciences Center North

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Blaha, Cilento, Culberson, Dey, Hilloowala, Kirk, Konat, Overman, Pinkstaff, Reilly, Reyer, Walker, and Wiggins. Associate Members Beresford, Friedman, Sorg, Sorrell, Labosky, and Pope.

The Department of Anatomy in the School of Medicine offers graduate programs which are committed to the training of competent researchers and capable teachers. This is accomplished by the completion of a carefully designed plan of study tailored to the individual student's interests. The program includes instruction in basic morphological, developmental, and functional aspects of human anatomy. Selected courses strengthen the area of interest of the student. The student conducts an original research project which culminates in a dissertation (Ph.D.) or a thesis (M.S.).

Admission Requirements

In addition to the admission procedure of the University, the Department of Anatomy requires that each applicant complete a departmental application

form obtained from the department. After an application is favorably reviewed by the departmental graduate studies committee, applicants are invited for a personal interview whenever practical. The applicant is admitted by a majority vote of the departmental graduate faculty.

It is recommended that the following courses be completed before entering the graduate program: algebra, trigonometry, general physics, inorganic and organic chemistry, general biology or zoology, comparative anatomy, embryology, genetics, cell biology or general physiology, and two years of French, German, or Russian. At the discretion of the department, a student may be allowed to complete a limited number of prerequisites after enrolling in the program. A grade-point average above 3.0 is desirable. The aptitude portion and an advanced section of the Graduate Record Examination are generally required. Also, three letters of recommendation from persons who can best evaluate the applicant's potential for graduate study should either accompany the application or be mailed to the Department of Anatomy separately. Applicants desiring consideration for financial aid should complete the application process as early as possible.

Doctor of Philosophy (Ph.D.)

The first year of study usually consists of course work within the Department of Anatomy. These courses include gross anatomy, microanatomy, neurobiology, introduction to research, and seminar in anatomy. Courses in other basic medical sciences, such as biochemistry and physiology, are usually taken in the second year. Students are in good standing while a minimum 3.0 overall grade-point average is maintained.

To be admitted to candidacy for the Ph.D. degree, the student must pass the preliminary examination, and prepare a plan for a research project to be undertaken for the dissertation. To be recommended for the Ph.D. degree, each student must complete a dissertation based on original research and defend the dissertation at an oral examination.

This program allows flexibility for each student. The precise plan of study is designed by the student and an advisory committee composed of faculty members selected by the student.

The student often culminates the training period with presentations at regional and/or national scientific meetings.

Master of Science (M.S.)

The master's program in anatomy is offered as a terminal degree primarily for students in certain specialized fields, such as physical therapy, or in a conjoint program in dentistry or medicine. It is not necessary for the student to complete the M.S. degree in order to qualify for admission into the Ph.D. program, although the student may elect to complete the requirements for this degree in progress toward the Ph.D.

Applicants who show a special need for the M.S. degree must generally be as well qualified as applicants to the doctoral program. The M.S. student must complete courses in gross anatomy and microanatomy and six to nine hours of required and elective courses. A 2.75 grade-point average must be maintained. In addition to course work, the student must complete a thesis based on original research and defend the thesis at an oral comprehensive examination.

Research and Instruction

Molecular and Developmental anatomy: experimental and descriptive embryology, cellular differentiation, and dedifferentiation, regeneration and the effects of drugs and other environmental agents on development;

Microscopic anatomy: studies of cells, tissues and organs, under normal and experimental conditions with *in vivo* microscopic, histochemical, electron microscopic, autoradiographic, and fluorescent techniques;

Gross anatomy: anatomical variations and anomalies, and electromyographic studies of specific muscle groups;

Neuroanatomy: experimental, comparative, and embryological studies of specific nerve cell groups and nerve pathways in the spinal cord, brain stem, cerebellum, and cerebrum.

Anatomy (Anat.)

301. *Gross and Developmental Anatomy: Trunk.* (For medical and a limited number of regular full-time graduate students in the medical basic sciences.) I. 5 hr. PR: Medical student standing or consent of chairperson. Gross anatomical study of the back, thorax, abdomen, pelvis, and perineum emphasizing clinically-related concepts.
302. *Gross and Developmental Anatomy: Head-Neck.* (For medical and a limited number of regular full-time graduate students in the medical basic sciences.) I. 3 hr. PR: Medical student standing or consent of chairperson. Gross anatomical study of the head and neck emphasizing clinically-related concepts.
304. *Gross and Developmental Anatomy: Extremities.* (For medical students and a limited number of regular full-time graduate students in the medical basic sciences.) I. 2 hr. PR: Medical student standing or consent of chairperson. Gross anatomical and developmental study of the upper and lower limbs emphasizing clinically-related concepts.
305. *Microanatomy.* (For medical students and a limited number of regular full-time graduate students in the medical basic sciences.) II. 5 hr. PR: Medical student standing or consent of chairperson. Cells, tissues, and organs.
308. *Neuroanatomy.* (For students in physical therapy and a limited number of regular full-time graduate students in the medical basic sciences, and students in other health sciences.) II. 2 hr. PR: Consent of instructor or chairperson. Gross and microscopic structure of the central nervous system.
309. *Microanatomy and Organology.* (For dental students and a limited number of regular full-time graduate students in the medical basic sciences.) I. 5 hr. PR: Dental student standing or consent of chairperson. Cells, tissues, and organs.
312. *Special Topics in Anatomy.* 2-4 hr. per. sem. PR: Anat. 301 or 324; and Anat. 305 or 309; consent of chairperson. Different topics of current interest in anatomy that are not included in the regular graduate courses.
314. *Applied Anatomy.* I, II. 2-6 hr. per sem. PR: Consent of instructor or chairperson. Detailed study of anatomy adapted to the needs of the individual student.
316. *Craniofacial Growth and Maturation.* I. 1 hr. PR: Consent of instructor. The current concepts of craniofacial growth and maturation are presented and integrated for application to clinical problems.
318. *Oral Histology and Embryology.* (For dental students and a limited number of regular full-time graduate students in the medical basic sciences.) II. 2 hr. PR: Dental student standing or consent of instructor or chairperson. Structure, function, and development of oral tissues.
319. *Advanced Head and Neck Anatomy.* II. 1 hr. PR: Dental, medical, or graduate student, or consent. Advanced head and neck craniofacial embryology and related functions as they apply to specialties in dental or medical practice.
324. *Human Gross Anatomy.* (For dental students and a limited number of regular, full-time graduate students in the medical basic sciences.) 7 hr. PR: Dental student standing or consent of chairperson. Human anatomy including cadaver dissection for dental students. 4 hr. lec., 3 hr. lab.

401. Advanced Gross Anatomy. 2-6 hr. per sem. PR: Anat. 301, 302, 304, and consent; or Anat. 324 and consnet. Morphological and functional analysis of a selected region, with dissection.

402. Advanced Developmental Anatomy. II. 2-4 per sem. PR: Anat. 301, 302, 304, and consent of instructor or chairperson. Detailed developmental anatomy of the fetal period and infancy. With dissections and analysis of variations and malformations.

403. Seminar. I, II. 1-6 hr. (1 hr. per sem.) (Course may be repeated.) PR: Consent of Graduate Committee. Special topics of current or historical interest.

405. Experimental Embryology. II. (Alternate Years.) 3 hr. PR: Embryology and cellular physiology and biochemistry and consent of instructor or chairperson. Development, differentiation, and regeneration.

406. Advanced Neuroanatomy. I. 2-4 hr. per sem. (Course may be repeated.) PR: CC MD 375 and consent of instructor or chairperson. Detailed study of selected areas of the nervous system.

408. Histochemistry. II. 3 hr. PR: Anat. 305 or 309, biochemistry, and consent of instructor or chairperson. Histochemical theory and techniques. (Offered in odd numbered years.)

451. Advanced Microanatomy. I, II, or S. 2-4 hr. PR: Anat. 305 or 309, or Biol. 263 and consent of instructor or chairperson. An extension of the major topics included in Anat. 305 or 309. Special emphasis on recent contributions.

490. Teaching Practicum I and II. 1-3 hr. Consent of chairperson. Supervised practice in college teaching of anatomy. Graded a S or U.

491. Advanced Anatomy. I, II. 1-6 hr. PR: Consent of chairperson.

497. Research. I, II, S. 1-15 hr. PR: Consent of Graduate Committee. (May be repeated as needed with consent of Graduate Studies Committee.)

ANIMAL AND VETERINARY SCIENCES

Paul E. Lewis, Chairperson of Division of Animal and Veterinary Sciences
G-038 Agricultural Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Dailey, Hoover, Inskeep, Klandorf, Lerner, Lewis, Martin, McCurley, Oscar, Peterson, Prigge, Reid, and Russell. Associate Members Collins, Dozsa, Horvath, Jordan, Osborne, Smith, and Wagner.

Master of Science (M.S.)

The Master of Science in animal and veterinary sciences in the College of Agriculture and Forestry allows maximum flexibility in courses and research problems. Students may emphasize physiology, production, breeding, nutrition, food, or veterinary sciences. They may work with beef and dairy cattle, sheep, swine, poultry, or laboratory animals. Research problems in farm animals form the basis for many studies, but a comparative approach is emphasized.

Admission requirements are those of the College of Agriculture and Forestry. Additional requirements are similar to those in other biological sciences. The student should have completed basic courses in the physical and biological sciences, including genetics, nutrition, and physiology. Deficiencies may prolong the time needed to complete degree programs.

A composite Graduate Record Examination score of 1,000 or better will be considered as a basis of admission. The fact that an applicant meets the above requirements shall not guarantee admission since each professor will accept

only the number of advisees which can be supervised adequately with available facilities, time, and funds.

A minimum of 24 approved hours of course work and a thesis are required for all master of science degrees. Students interested in study leading to the Ph.D. degree should apply for acceptance into the Ph.D. program in Agricultural Sciences.

Animal and Veterinary Science (A&VS)

- 420. *Special Topics.* I, II, S. 1-4 hr. (1 hr. credit in special cases only). Advanced study in particular phases of such animal science topics as animal production, nutrition, physiology, breeding and genetics, veterinary science, and food. (For the Master's Degree, Special Topics ordinarily may count 2 to 4 hr.; max. credit, 6 hr.).
- 491. *Advanced Study.* I, II, S. 1-6 hr.
- 497. *Research.* I, II, S. 1-15 hr. Research in animal nutrition, physiology, breeding and production, and veterinary science.

Animal Nutrition (An. Nu.)

- 301. *Principles of Nutrition and Metabolism.* I. 3 hr. PR: Ag. Bi. 210 or consent. A basic course in principles of nutrition with emphasis on the major classes of dietary nutrients and their digestion and utilization.
- 302. *Nutrition and Physiological Function.* II. 3 hr. PR: An. Nu. 301 or consent. Sequence to An. Nu. 301. Techniques used in nutritional studies and the relationship of nutrient requirements to physiological function in species of laboratory and domestic animals and man.
- 430. *Rumen Metabolism and Physiology.* I. 3 hr. PR: Course in biochemistry. The anatomy and physiology of the forestomachs of ruminants and the rumen microbial population. Emphasis on the microbial metabolism as it pertains to the utilization of feeds by ruminants. (Offered in Fall of odd years.)
- 432. *Forage Chemistry and Quality.* 3 hr. PR: An. Nu. 301 and Agron. 254, or consent. Advanced course in chemistry and biochemistry of pastures and forages, emphasizing factors affecting their quality and principles governing their utilization by herbivorous animals. (Also listed as Agron. 432.) (Offered in Spring of even years.)
- 434. *Mineral Nutrition of Animals.* II. 3 hr. PR: An. Nu. 301 or consent. Mineral nutrition of livestock and man; soil-plant-animal interactions. Detailed treatment of function of individual elements and their involvement in deficiency and toxicity conditions on an international basis. (Offered in Spring of odd years.)
- 450. *Seminar.* I, II. 1 hr.
- 491. *Advanced Study.* I, II, S. 1-6 hr. (Repeat registration permitted for maximum of 6 credit hours per year.) Topics in advanced nutrition. Subject will be selected by staff for formal presentation.

Animal Physiology and Breeding (An. Ph.)

- 200. *Animal Growth and Lactation Physiology.* 3 hr. PR: An. Ph. 100, or consent. Animal life cycles; nature of growth and lactation; effects of biological, environmental, and social-psychological variants; physiological regulation and control.
- 204. *Animal Physiology Laboratory.* I. 2 hr. PR: An. Ph. 100 or consent. Laboratory study of the physiological systems of animals and the influences of environment on these systems.
- 225. *Physiology of Reproduction.* II. 3 hr. PR: Course in biology. Comparative physiology of reproduction in higher animals; endocrine functions involved in reproduction; genetic and environmental variations in fertility mechanisms.

226. *Breeding of Farm Animals*. I. 3 hr. PR: Course in genetics or consent. Application of principles of quantitative genetics to the improvement of farm animals.

280. *Behavioral Patterns of Domestic Animals*. II. 3 hr. Examination of the bases for exhibition and control of behavioral patterns of domestic animals. 1 lab.

425. *Endocrinology of Reproduction*. II. 4 hr. (2 labs.). PR: An. Ph. 225 or Biol. 268 or equiv. Discussion of and laboratory experience in classical and current concepts of hormonal and neurohormonal regulations of reproductive phenomena with emphasis on species differences and similarities. (Offered in Spring of odd years.)

426. *Advanced Animal Selection*. II. 3 hr. PR: Course in statistics and course in genetics or equiv. An advanced course dealing with the basic concepts of experimental and statistical approaches in the analysis of quantitative inheritance with special reference to the magnitude and nature of genotypic and nongenotypic variability. (Offered in Spring of even years.)

450. *Seminar*. I, II. 1 hr.

Animal Production (An. Pr.)

250. *Current Literature in Animal Science*. I. 3 hr. PR: An. Nu. 101. Evaluation of current research in animal science and its application to production and management.

422. *Advanced Milk Production*. II. 3 hr. PR: An. Nu. 101 or consent. Advanced study of the feeding, breeding, and management of dairy cattle.

Food Science (Fd. Sc.)

267. *Advanced Meat Science*. I, S. 3 hr. PR: Fd. Sc. 167. Theoretical and experimental aspects of meat science, meat product/process systems, and the quantitative biology of muscle systems used for food.

Veterinary Science (Vet. S.)

205. *Parasitology*. II. 3 hr. PR: Course in biology or consent. Common parasites of farm animals, their life cycles, effects on the host, diagnosis, control, and public health importance. 3 hr. lec., 1 hr. lab.

210. *Principles of Laboratory Animal Science*. I. 3 hr. PR: Consent for undergraduates. The management, genetics, physiology, nutrition, disease, and germ-free quar- tering of common laboratory animals. 1 lab.

ART

Carmon Colangelo, Graduate Adviser, Division of Art
Creative Arts Center

Degrees Offered: Master of Arts, Master of Fine Arts

Graduate Faculty: Members Anderson, Colangelo, Couch, Harvey, Rajam, Schultz, and Thomas. Associate Members Faulkes, Fergus, Helm, Krainak, and Lucas.

The graduate programs in art lead to a master of arts with emphasis in art (one to two years or 30 credit hours) and to a master of fine arts with emphasis in visual art (two to three years or 60 hours). Both of these programs are highly selective and closely integrated parts of the professional education in art offered by the Division of Art. All applicants are expected to have artistic maturity and the motivation to achieve excellence in their areas of concentration.

The Division of Art is an accredited institutional member of the National Association of Schools of Art and Design, the only nationally recognized accrediting agency for professional art instruction. Applicants to programs in art must comply with the standards for admission set by West Virginia University, the College of Creative Arts, and the Division of Art.

All students enter the graduate programs in art as probationary candidates. Students in the M.F.A. program are reviewed for advancement at the end of their first year of study or upon the completion of 28-30 credit hours. Students in the M.A. program are reviewed at the end of their first semester of study or upon the completion of 12-15 credit hours. A satisfactory review allows students to have degree candidate status. Candidacy status must be approved by the student's graduate committee. All students in degree programs, either M.F.A. or M.A., must prepare a written problem report. A graduate exhibition may be required of a student on the recommendation of his/her graduate committee.

General Requirements

Deficiencies: Before students are admitted, they must meet any deficiencies in their undergraduate preparation. Credits taken to erase deficiencies do not count toward a graduate degree.

Academic Standards: The Division of Art has high expectations for its graduate students. Because of this, certain standards of achievement exceed the minimum standards set by the University for all graduate students. The Division of Art reserves the right to impose stricter limitations on all art graduate students. Credit hours in courses with an earned grade of "C" do not automatically count toward graduate degree requirements. The graduate committee and the division chairperson have the right to declare such credit hours unacceptable.

Materials and Equipment: All graduate art majors are required to purchase most of their personal equipment and expendable supplies. Some studio areas purchase bulk supplies for student use in their courses. The average cost to students sharing the cost of bulk purchases ranges from \$100 to \$150 per semester.

Problem Report: All candidates for a graduate degree in art must prepare a written problem report related to their work and activity as a graduate student. The chairperson of the student's graduate committee supervises the preparation of the problem report, which must be completed at least one month before the anticipated graduation date. The problem report must be prepared according to the form prescribed in the WVU regulations governing the preparation of dissertations and theses unless an exception is authorized in advance by the student's graduate committee and the division chairperson.

Change of Graduate Program: A probationary candidate in a graduate art program is not guaranteed acceptance into another graduate art program. A change from the M.F.A. program to the M.A. program (or the reverse) must be approved by the graduate faculty of the Division of Art. Under normal conditions, such a change is not considered until the student has established credibility by successfully completing 12-15 approved credit hours of study at WVU. A change to a program outside the Division of Art must be approved by the receiving unit. To make an application for a double degree program or special interdepartmental programs at the graduate level, students must have written prior approval of the division chairperson.

Application Procedures

Requests for application forms for admission to graduate degree programs in art must be addressed to the Office of Admissions and Records, West Virginia University, P.O. Box 6009, Morgantown, WV 26506-6009. Applicants must specify the degree and subject area of their choice and return the application and transcripts from each college or university previously attended to the above address with a \$20 non-refundable processing fee.

All applicants, for both the M.F.A. and the M.A., must present a portfolio for admission to the Division of Art. Applicants should take care to select slides of recent and representative work for inclusion in the portfolio. The portfolio must contain a statement of purpose, and three letters of recommendation from college faculty or persons knowledgeable of the applicant's interests and abilities, and twenty 35mm slides as they come from the processing laboratory, (neither remounted nor retaped). Each slide should be labeled with name, date of completion, size of work, and type of medium and arranged in an 8" by 11" transparent plastic slide holder for mailing. The complete portfolio, with the purpose statement, three letters, and 20 slides, should be submitted to:

Graduate Adviser
Division of Art
College of Creative Arts
West Virginia University
P.O. Box 6111
Morgantown, WV 26506-6111

Provide a stamped, self-addressed envelope to assure prompt, safe return of the slides.

Master of Fine Arts in Visual Arts

The M.F.A., a professionally oriented terminal degree in the studio arts, requires a baccalaureate degree in art or its equivalent for admission. Preparation should include 12 hours of art history, 70 hours of studio art related to professional needs, and 36 hours of general education.

Requirements: The suggested distribution of studies for the 60 credit hour program is:

Art Studio Major Area	36 hours
Art Studio Elective.....	6 hours
Teaching practicum or Professional Practice.....	6 hours
Art History	6 hours
Graduate Exhibition and Problem Report	6 hours

To earn the M.F.A., a student must complete a combined (undergraduate and graduate) total of 118 hours in studio, 18 hours in art history, and the appropriate number of credit hours in general education courses.

All students in the M.F.A. program are required to submit a statement of intention after completion of 12 credit hours, to indicate the direction and implementation of their studio involvement, with an outline of their problem report.

Transfer M.F.A. Credit: In addition to the application materials listed, transfer students must ask to transfer graduate work completed elsewhere. Transcripts must accompany the written request. Transfer credit is not automatic. The art faculty review committee, the graduate adviser, and the division chairperson will determine how much, if any, previous graduate-

level work may be transferred. At least 60 percent of the work for the M.F.A. must be completed at WVU in the studio arts.

M.F.A. Curriculum: The M.F.A. student must complete the stated requirements in order to graduate, usually in a two-year period. Most students take 15 hours per semester. All students accepted into the M.F.A. program are required to spend four full-time semesters (excluding summer sessions) in residence. A waiver of this requirement may be requested from the graduate adviser of the Division of Art, based on accepted transfer credit or previously completed requirements. Concentrations for the M.F.A. include ceramics, graphic design, painting, printmaking, and sculpture.

The following is the recommended distribution of required M.F.A. courses:

<i>First Year—Probationary Candidate</i>	<i>Hr.</i>
Art Studio Major Area	18
Art Studio Elective.....	3
Teaching Practicum or Professional Practice*.....	6
Art History**	<u>3</u>
	30

*Professional practice courses will be practical, including business studies for students intending to maintain studios as a private enterprise; administrative studies for those intending to work in art centers, museums, or school administration; teaching practicum for those who expect to teach at the college or university level. Graduate Assistants expecting to teach during their second year should complete 6 hours of teaching practicum during the first year. Students with teaching experience may be exempt from this restriction.

**Graduate credits in art history must be at the 300-level (graduate) and are in addition to courses taken or required at the undergraduate level.

<i>Second Year—M.F.A. Candidate</i>	<i>Hr.</i>
Art Studio Major Area	18
Art Studio Elective.....	3
Art History*	3
Graduate Exhibition and Problem Report**	<u>6</u>
	30

*Graduate credits in art history must be at the 300-level (graduate) and are in addition to courses taken or required at the undergraduate level.

**Graduate exhibition and problem report (Art 400) will include organized graduate seminars, problem report review periods, committee meetings, and exhibition preparation discussions.

Master of Art in Art

Art Education Concentration (30 credit hours)

Art education is a popular option for graduate study in art. Specialization in art education requires the completion of 30 credit hours program. The exact course of study is determined through consultation with a student's adviser. The art education concentration may be completed in one year of full time study. The general distribution of graduate credits is as follows:

	<i>Hr.</i>
Art studio major area	9
Art studio elective	6
Art education or approved studies	15
Art 400 (Problem report)	<u>3</u>
	30

Every graduate student is required to prepare a written problem report. The graduate art faculty recommend those students who may be required to hold a graduate exhibition.

Art History Concentration

(30 credit hours)

The art history concentration is accredited by the National Association of Schools of Art and Design. For information about this option, please contact the coordinator of art history or the graduate adviser in the Division of Art. The general distribution of graduate credits for a concentration in art history is as follows:

	Hr.
Art history	21
Cognate courses	6
Art 400 (Problem report)	<u>3</u>
	30

Studio Art Concentration

(30 credit hours)

The studio art concentration allows students to specialize in ceramics, graphic design, painting, printmaking, or sculpture.

Admission Requirements: Applicants desiring to begin a course of study leading to the Master of Arts in art and concentration in the studio arts must have a baccalaureate degree in art or the equivalent. Undergraduate study should include 12 hours of art history, 45 hours of studio art related to professional needs, and 36 hours of general education courses.

The concentration in studio art requires:

	Hr.
Art Studio Major Area	18
Art Studio Elective or Professional Practice*	3
Art History**	6
Art 400 (Problem report)	<u>3</u>
	30

*In lieu of art studio elective instruction, students may take professional practice courses which are practical in nature. Exact courses of study are determined in consultation with the graduate adviser.

**Graduate credits in art history must be at the 300-level (graduate) and are in addition to courses taken or required at the undergraduate level.

The student must complete the stated degree requirements in order to graduate. These credits can be earned in one year. After consultation with the graduate adviser, students specializing in studio arts are required to prepare a study list of course to be taken to satisfy Division of Art requirements. Changes in this list must be requested in writing and approved by the chairperson of the division.

Financial Aid and Graduate Assistantships: Financial aid information is available through the Student Financial Aid Office, West Virginia University, P.O. Box 6004, Morgantown WV 26506-6004. Graduate assistantships in art are awarded to students of exceptional promise by the faculty of the Division of Art. Application forms must be requested from the graduate adviser, Division of Art, College of Creative Arts, West Virginia University, P.O. Box 6111, Morgantown, WV 26506-6111, and submitted with the portfolio.

Art (Art)

200. *Directed Art Studies. I, II, S. 1-15 hr. (May be repeated for credit.) PR: Consent. Studies in painting, sculpture, printmaking, graphic design, ceramics, drawing, art education, art history; includes independent study.*

211. *Figure Drawing. I, II, S. 3 hr. (May be repeated for credit.) PR: Art 12, 121 or equiv. A course in compositional structure from the figure.*

212. *Advanced Drawing. I, II, S. 3 hr. (May be repeated for credit.) PR: Art 211 or equiv. Advance tutorial drawing course.*

300. *Graduate Art Studies. I, II, S. 1-15 hr. (May be repeated for credit.) PR: Consent. Studies in painting, sculpture, printmaking, graphic design, ceramics, drawing, art education, art history; includes independent study.*

400. *Graduate Exhibition and Problem Report. I, II. 3-6 hr. PR: Consent.*

490. *Teaching Practicum. I, II. 3 hr. PR: Consent. Supervised practices in college teaching of studio art.*

496. *Graduate Seminar. I, II. 1 hr. PR: Consent. It is anticipated that each graduate student will present at least one seminar to the assembled faculty and graduate student body.*

BIOCHEMISTRY

Diana S. Beattie, Chair

3124 Health Sciences North

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Beattie, Blair, Butcher, Canady, Durham, Evans, Harris, Jagannathan, Miller, Rafter, Tryfiates, Vrana, Wimmer, and Wirtz. Associate member Spearman.

Graduate programs in the Department of Biochemistry are designed to assist students in the development of their own capabilities for independent thought and research. All students are provided with a strong biochemistry background; however, the program has sufficient flexibility to allow individual students to select advanced specialty courses in biochemistry which are of particular importance to their career goals. Faculty research problems are of current interest and are diverse, reflecting the broad spectrum of areas encompassing biochemistry.

Admission Requirements

A prospective graduate student should hold a bachelor's degree with a science major and should have successfully completed courses in qualitative-quantitative chemical analysis, organic chemistry, calculus, physics, and physical chemistry. In some cases, a deficiency in the above may be made up after admission into the program.

Application is made by submission of the following items to the Department of Biochemistry: (a) the completed departmental application form (sent on request); (b) three letters of recommendation from professors who can evaluate the student's present abilities and potential; (c) official transcript of the applicant's college grades; and (d) official copy of Graduate Record Examination scores. Due to the sequence of courses, entrance in the fall is preferred, but exceptions may be made as necessary. Application material and program details may be obtained by writing: The Graduate Coordinator, Department of Biochemistry, School of Medicine, West Virginia

University, Morgantown, WV 26506. The deadline for receipt of applications and supporting documents by the department is June 1; to be considered for financial support, applications should be submitted by February 1.

Doctor of Philosophy (Ph.D.)

To assure that all students become familiar with the basic principles of biochemistry, the first year of the Doctor of Philosophy (Ph.D.) program is devoted primarily to course work. In addition to formal courses during the first semester, students participate in a laboratory program which involves all faculty members. This laboratory experience is designed to illustrate the basic research skills involved in biochemistry. During the second semester, students will undertake research in at least two laboratories of their choice.

Upon successful completion of the first year, students will choose a dissertation research adviser, at which time emphasis will be placed on research. During the second year, specialized courses in biochemistry will be offered as the students continue their research programs. During subsequent years, the students emphasize independent thesis research, and a few formal courses are taken.

An essential component of the Ph.D. program is participation in departmental journal clubs and seminars. Both students and faculty participate, thus students learn to effectively organize and present research material to a large group of people.

Completion of the Ph.D. program is realized when the student successfully presents the research results to both the Department of Biochemistry and a graduate advisory committee. Typically, four years are required to realize this goal.

Master of Science (M.S.)

The Department of Biochemistry offers the thesis master's degree. This program involves completion of a master's research project in addition to formal course work. Two to three years are generally required to complete the M.S. program.

Research and Instruction

Research Areas—Hormonal regulation of metabolism. Structure and function of nucleic acids. Chemistry of enzymes and serum proteins. Nutritional oncology. Secretory mechanisms. Biogenesis of membranes. Regulation of gene expression.

Biochemistry (Bioch.)

231. *General Biochemistry. I.* 7 hr. PR: General chemistry, organic chemistry. (For medical students; others by consent.) Consists of seven main lectures, one clinical correlation lecture, and one problem session per week.
239. *Clinical Chemical Techniques. II.* 4 hr. PR: Bioch. 139, 231 or equiv. (Primarily for medical technology students; open to other qualified students by consent.)
305. *General Biochemistry. II.* 4 hr. PR: Inorganic chemistry, organic chemistry, and consent. (For dental and graduate students.) Lecture, conference, and demonstration.
399. *Special Topics. I, II.* 1-2 hr. PR: Consent. Journal Club, Teaching and Laboratory Rotations.

490. *Teaching Practicum I and II.* 1-3 hr. Consent of chairperson. Supervised practice in college teaching of biochemistry. Graded as S or U.

491. *Advanced Study.* I, II. 1-6 hr. PR: Consent. Physical techniques in biochemistry; nucleic acids and protein biosynthesis; enzymology and protein chemistry; metabolic regulation (each topic—one semester; offered alternate years). Designed primarily to provide a background for students who will do research in biochemistry and molecular biology. (Nucleic Acids—Fall, 1991; Cell Biology—Spring, 1990; Metabolic Regulation—Fall 1990; Enzymology—Spring, 1991.)

496. *Graduate Seminar.* I, II. 1 hr. PR: Consent. Presentation and discussion of special topics.

497. *Research.* I, II, S. 1-15 hr. PR: Consent.

BIOLOGY

Leah A. Williams, Chairperson of the Department

Dennis C. Quinlan, Associate Chairperson

200 Brooks Hall

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Blaydes, Clarkson, DeCosta, Gallagher, Garbutt, Katula, Keller, Kotarski, Lang, Leonard, McGraw, Marshall, Quinlan, Sutter, and Williams. Associate member Guthrie.

The Department of Biology offers graduate studies leading to the degrees of doctor of philosophy and master of science. The Ph.D. degree is offered in the area of cellular and molecular biology with research concentration in the areas of gene regulation and transcriptional control during development; repair to DNA damaged by radiation and chemicals; positional effect on gene expression in *drosophila*; cellular and molecular bases of regulation of cell proliferation; pheromonal communication; and regulation of cholesterol metabolism in mammalian cells. The master of science provides specialization in population genetics, plant ecology, environmental plant systematics, plankton ecology, environmental ecology, and animal behavior as well as in cellular and molecular biology. Each degree requires completion of an original research project which represents the principal theme about which the graduate program is constructed. Students may work toward an advanced degree only with the approval of the department.

Master of Science (M.S.)

Applicants for the master of science program in biology must show at the minimum the equivalent of a bachelor's degree from an accredited institution, an undergraduate grade-point average of 3.0, a 50th percentile ranking for the verbal and 50th percentile ranking for the quantitative sections of the Graduate Record Examination; an adequate science background, which normally includes one year of physics and two years of chemistry; and a sufficient knowledge in biology as reflected in scores normally greater than the 50th percentile on all three sections of the advanced Biology Test of the GRE. Applicants are requested to submit an essay describing past research experience and expectations for career goals. Three letters of recommendation from individuals familiar with the applicant's academic performance are required as well as an official transcript from all colleges or universities attended as an undergraduate. The Department of Biology's Graduate Committee reviews the applicant's records and makes the decision to admit or reject the applicant.

The WVU general requirements for the master of science are outlined elsewhere in the graduate catalog. Students in the biology M.S. program may apply up to six hours of research credit toward the 30-hour requirement; the remaining 24 hours of credit must be earned in graduate courses which reflect a diversified exposure to biology. The establishment of an advisory committee and the generation of a program of study are explained in detail in the department's Graduate Student Handbook. A final oral examination is administered by the advisory committee after the program of study has been completed and the thesis has been submitted.

Doctor of Philosophy (Ph.D.)

The program for the degree of doctor of philosophy concentrating in cellular and molecular biology reflects a flexible, research-oriented approach geared to develop the interests, capabilities, and potentials of mature students. Applicants must have met all the entrance requirements listed above for the master of science program. Acceptance into the Ph.D. program is by vote of the Graduate Committee of the Department of Biology. This committee insures that all entrance requirements are met or that provisions have been made to remedy the deficiencies, and that facilities and personnel are adequate to support the program to a successful conclusion.

Each student admitted to the Ph.D. program works under the close supervision of a faculty research adviser and an advisory committee, both of which must be approved by the Graduate Committee of the Department of Biology; details on the composition and establishment of an advisory committee are available in the Graduate Student Handbook. Students must have a program of study formulated and approved within 12 months of entering the Ph.D. program; all deficiencies must have been removed earlier. Significant deviations from an established program of study require approval from the advisory committee and the graduate committee.

The advisory committee is responsible for overseeing the progress of the student and for administering and judging performance in the several required examinations; it insures that all Department of Biology, College of Arts and Sciences, and University requirements are met during the course of the student's study program. The program of study outlines the research to be conducted and specifies the courses to be taken in support of the proposed research.

Students must successfully complete a series of three written and oral intermediate examinations in order to be promoted to candidacy. The first, a dissertation proposal examination, consists of a written dissertation research proposal. Thereafter, the proposed research is presented orally in the form of a departmental seminar. The next is a series of written qualifying examinations. The written qualifying examination is followed by an oral examination designed to determine the student's ability to deal with a specific area of research not directly related to his/her own research proposal; the student must present a public seminar on the topic and be prepared to answer questions on any matter related to the topic.

The three intermediate examinations are usually taken during the third, fourth, and fifth semesters of the program. Successful passage of the three intermediate examinations leads to promotion to candidacy, wherein the student may concentrate fully upon the dissertation research and prepare for the final examination. The final examination consists of the submission of a completed and acceptable written dissertation, an oral dissertation defense,

and the presentation of a formal departmental seminar covering the dissertation research.

Biology (Biol.)

201. *History of Biology*. I. 3 hr. PR: Biol. 1, 3 and 2, 4 or equiv. History of development of biological knowledge, with philosophical and social backgrounds.
209. *Topics and Problems in Biology*. I, II, S. 1-4 hr. (May be repeated for max. of 6 hr.) PR: Permit required. Topics and problems in contemporary biology. All topics or problems must be selected in consultation with the instructor.
211. *Advanced Cellular/Molecular Biology*. II. 3 hr. PR: Biol. 19 or consent. Advanced study of fundamental cellular activities and their underlying molecular processes.
212. *Advanced Cellular/Molecular Biology—Laboratory*. II. 1 hr. PR or Conc.: Biol. 211 or consent. Experimental approaches to the study of cellular systems. 1 hr. lab.
214. *Molecular Basis of Cellular Growth*. I. 3 hr. PR: Biol. 19 or consent. Study of the integration of molecular events as they regulate the growth and division of cells. Topics include: hormones as cell effectors, control of gene expression, and the cancer cell as a model system.
216. *Cell and Molecular Biology Methods*. I. 3 hr. PR: Biol. 19 or consent. Introduction to the theory and application of basic analytical tools used in molecular biology. Selected topics included are: hydrodynamic methods, chromatography, electrophoresis, and general laboratory methods. (Offered in Fall of even years.)
219. *Introduction to Recombinant DNA Technology*. I. 4 hr. PR: Biol. 19 or consent. An introductory course covering the basic principles and techniques of recombinant DNA technology. Includes molecular cloning, isolation of plasmid DNA, agarose/ acrylamide gel electrophoresis, restriction enzyme mapping, nucleic acid hybridization, and DNA sequencing.
231. *Animal Behavior*. I. 4 hr. PR: Biol. 1, 3 and 2, 4 or 15, Psych. 1, or consent. Introduction to animal behavior (ethology) emphasizing the biological bases and evolution of individual and social behaviors; laboratory includes independent investigation of behavioral phenomena.
232. *Physiological Psychology*. I. 3 hr. PR: 9 hr. psychology, behavior, physiology, or graduate standing. Introduction to physiological mechanisms and the neural basis of behavior. (Also listed as Psych. 232.)
233. *Behavioral Ecology*. I. 3 hr. PR: Biol. 21 or consent. Consideration of the influences of environmental factors on the short- and long-term regulation, control, and evolution of the behaviors of animals. (Offered in Fall of even years.)
234. *Physiology of Animal Behavior*. II. 3 hr. PR: Biol. 231 or consent. Explores the way behavior is controlled in a wide variety of animals so that commonalities and varieties of neural and endocrine mechanisms may be better understood. (Offered in Spring of even years.)
235. *Primate Behavior*. II. 3 hr. PR: Biol. 1, 3 and 2, 4 or 15 or consent. Primates as they exist in their natural habitats, as they suggest clues to human behavior and the evolution of behavior. Case studies and comparative primate behavior of prosimians to monkeys, to apes, to human hunters and gatherers. (Also listed as Soc. & A. 257.)
240. *Methods in Ecology and Biogeochemistry*. II. 3 hr. PR: Biol. 21. or consent. Introduction to the theory and application of basic analytical tools used in ecology and biogeochemistry. Topics include sampling of terrestrial and aquatic organisms and their environment, and chemical analyses of biological materials. (Offered in Spring of odd years.)

242. *Acid Precipitation on Aquatic Ecosystems*. II. 3 hr. PR: Biol. 1, 3 and 2, 4, or Biol. 15, or equiv. Acid precipitation and its effects on freshwater ecosystems including all biological communities as well as overall effects on system functions and studies to assess the recovery from whole lake treatments.

243. *Plant Ecology*. I. 4 hr. PR: Biol. 1, 3 and 2, 4, or 21, or consent. Environmental and ecological relationships of plants.

246. *Limnology*. I. 4 hr. PR: Biol. 1, 3 and 2, 4, or 21, or consent. Physical, chemical, and biological characteristics of inland waters with an introduction to the principles of biological productivity.

247. *Aquaculture*. I. 3 hr. PR: Biol. 1, 3 and 2, 4, or 15, or consent. An introduction to the farming and husbandry of freshwater and marine organisms. (Overnight field trips are voluntary.) (Offered in Fall of odd years.)

250. *Aquatic Seed Plants*. I. 3 hr. PR: Biol. 1, 3 and 2, 4, or 21, or consent. Classification, ecology, and economic importance of aquatic seed plants.

251. *Principles of Evolution*. I. 3 hr. PR: Biol. 1, 3 and 2, 4, or 15, 17, 19, or 21, or consent. Introduction to the study of evolution.

252. *Flora of West Virginia*. II. 3 hr. PR: Biol. 1, 3 and 2, 4, or consent. Consideration of the native plant life of the state.

253. *Structure of Vascular Plants*. II. 4 hr. PR: Biol. 1, 3 and 2, 4, or 21, or Pl. Sc. 52, or consent. Development and evolution of vegetative and reproductive structures of vascular plants.

254. *Plant Geography*. II. 3 hr. PR: Biol. 1, 3 and 2, 4, or 15, or consent. Study of plant groupings and worldwide distribution of plants.

255. *Invertebrate Zoology*. II. 4 hr. PR: Biol. 1, 3 and 2, 4, or 21. Advanced study of animals without backbones.

257. *Ichthyology*. II. 3 hr. PR: Biol. 1, 3 and 2, 4, or 21, or consent. Internal and external structure of fishes, their systematic and ecological relationships, and their distribution in time and space. (Dissection kit required.)

259. *General Parasitology*. II. 4 hr. PR: Biol. 1, 3 and 2, 4, or 21, or consent. Introduction to the biology of parasites. (Dissection kit required.) (Also listed as M. Bio. 224.)

260. *Plant Development*. I. 4 hr. PR: Biol. 15, 17, 19, and 21, and organic chemistry or biochemistry, or consent. Experimental studies of plant growth and development.

261. *Comparative Anatomy*. I. 4 hr. PR: Biol. 15, 17, 19, and 21, or consent. A functional and evolutionary study of vertebrate structure. (Dissection kit required.)

262. *Vertebrate Embryology*. II. 4 hr. PR: Biol. 15, 17, 19, and 21, or consent. An experimental and descriptive analysis of vertebrate development.

263. *Vertebrate Microanatomy*. II. 5 hr. PR: Biol. 15, 17, 19, and 21, or consent. Structural and functional approach to the study of tissues and organs of vertebrates.

268. *Physiology of the Endocrines*. I. 3 hr. PR: Biol. 15, 17, 19 and 21 or consent. Regulation of the organs of internal secretions, and mechanisms of action of the hormones produced.

269. *Physiology of the Endocrines—Laboratory*. I. 1 hr. PR or Conc.: Biol 268. Experimental techniques used in study of the endocrine system.

270. *General Animal Physiology*. I. 3 hr. PR: Biol. 15, 17, 19, and 21, or consent. In-depth, current treatment of physiological principles which operate at various levels of biological organization in animals of diverse taxonomic relationships. Understanding is developed from background lectures and student analysis in discussion sessions of research literature.

271. *General Animal Physiology—Laboratory*. I. 1 hr. PR or Conc.: Biol. 270. After learning basic techniques, students are provided the opportunity to design, execute, and report on an independent research project in physiology.

309. *Topics and Problems in Biology*. I, II, S. 1-4 hr. PR: Consent. Topics and problems in contemporary biology, to be selected in consultation with instructor.

311. *Biology Seminar*. I, II. 1 hr. Discussions and presentations of general interest to biologists.

314. *Molecular Cell Biology*. II. 3 hr. PR: Consent. An advanced course presenting contemporary methodologies and their application to the study of problems in cellular organization, molecular genetics, and developmental biology. Introduction to the research literature is stressed.

315. *Molecular Basis of Virology*. I. 3 hr. PR: Biol. 19 or equiv., or consent. Lectures on bacterial, animal, and plant viruses; their structure, replication, and interaction with host cells. Discussion of the contributions virology has made to the understanding of molecular mechanisms in biology.

320. *Molecular Biology of the Gene*. I. 3 hr. PR: Biol. 19 or consent. Comprehensive survey of basic principles, theories, and techniques of molecular biology, including structure/function of nucleic acids, DNA replication, transcription, translation, recombination, gene regulation, and function. 3 hr. lec.

340. *Ecosystem Dynamics*. I. 3 hr. PR: Biol. 15, 17, 19, and 21 or equiv. Studies of modern approaches to ecosystem analysis. Emphasis will be on energy and material transfers. Approach will be holistic.

345. *Fisheries Science*. II. 4 hr. PR: Biol. 257 or equiv., or consent. Population dynamics in relation to principles and techniques of fish management. (Offered in Spring of even years.)

355. *Advanced Plant Systematics 1*. II. 3 hr. PR: Biol. 151 or equiv. Taxonomy of pteridophytes, gymnosperms, and monocotyledons.

356. *Advanced Plant Systematics 2*. II. 3 hr. PR: Biol. 151 or equiv. Taxonomy of dicotyledons.

362. *Developmental Biology*. I. 3 hr. PR: Biol. 262 or equiv., organic chemistry or biochemistry, or consent. The molecular and cellular basis of differentiation and morphogenesis. (Offered in Fall of odd years.)

364. *Advanced Plant Physiology*. I, II. 3 hr. PR: Biol. 169 or equiv., organic chemistry, general physics, and consent. Advanced studies of plant processes including recent advances in the field. I. Second Semester, odd-numbered years—Water relations and mineral nutrition and translocation. II. First Semester, odd-numbered years—Plant growth and development. III. Second Semester, even-numbered years—Environmental physiology.

497. *Research*. I, II, S. 1-15 hr.

BIOMEDICAL SCIENCES—MARSHALL UNIVERSITY

Gary O. Rankin, Coordinator of the Program

Marshall University Medical Education Building, 1542 Spring Valley Dr., Huntington, WV 25704

Degree Offered: Doctor of Philosophy

Graduate Faculty: Members Aulick, Berk, Brown, Chertow, DeMesquita, Fenger, Fish, Gruetter, Johnson, Larsen, Lotspeich, McCumbee, Moore, Mufson, Rankin, Simmons, Szarek, Valentovic, Waldron, Wang, and Zill. Associate Members fix, Guyer, Moat, Primerano, and Reichenbecher.

The Basic Science Departments of Marshall University School of Medicine offer a program of study conjointly with West Virginia University which leads to the degree of doctor of philosophy in the biomedical sciences. The work for this degree is done on the Marshall University campus in Huntington, West Virginia, with the degree awarded by West Virginia University.

The primary aim of the program is to graduate doctoral students who are broadly based in the biomedical sciences, but who have definite interests and special training in anatomy, biochemistry, microbiology, pharmacology, or physiology. The program is designed to be flexible and research oriented in order to prepare a student for a career in one of the areas of academic or industrial biomedical science.

Admission

Students who wish to enroll in the doctor of philosophy program must apply for admission through the Marshall University Graduate School. They must meet the admission requirements of West Virginia University, the Marshall University Graduate School, and the Graduate Studies Committee of the Marshall University School of Medicine. Interested persons should contact the Biomedical Program Coordinator, Department of Pharmacology, Marshall University School of Medicine, Huntington, WV 25744-9310.

Applicants to the doctor of philosophy in biomedical sciences program must possess a baccalaureate degree with undergraduate-level course work including: one year of general biology, one year of general physics, one year of introductory chemistry, and one year of organic chemistry, all with associated laboratories. Although not required for admission, undergraduate course work in calculus and physical chemistry is desirable as it may be prerequisite for advanced course work in certain areas of specialization.

Applicants should submit to the Biomedical Program Coordinator three letters of recommendation and Graduate Record Examination scores (aptitude and advanced). In addition, transcripts and an admission application must be sent to the Marshall University Office of Admissions, Huntington, WV 25701.

Applicants who already possess a master of science in biomedical sciences, or equivalent experience, are eligible to apply for full admission directly into the doctor of philosophy program in biomedical sciences. The requirements for full admission into the program are essentially the same as those required for award of the master of science in biomedical sciences with the exception that a requirement for a master's thesis may be waived.

Applicants who do not possess a master of science in biomedical science, or equivalent experience, but who do meet all of the other requirements listed above can be provisionally accepted into the doctoral program. Provisional acceptance requires the student to successfully complete the master's course work prior to full acceptance.

Program Requirements

Every student must take courses in cellular and molecular biology, statistics, and seminar. In addition, each student, with approval of his/her advisory committee, must successfully complete at least one basic course (minimum four credit hours) in a minimum of three basic biomedical science departments. Elective courses, chosen with concurrence of the student's advisory committee, will provide the remainder of the required credit hours (a minimum of 18).

Upon admission to the doctoral program, the student's doctoral advisory committee will be formed. The doctoral advisory committee consisting of six members will periodically review the student's progress as well as act as the examination committee. One member, the student's research adviser, will serve as the committee chairperson. One other member from the student's major department and two from other departments (one each from the student's two minor departments) will be recommended to the Marshall Graduate School dean for appointment to the committee by the student's research adviser. The two remaining members of the advisory committee will be appointed from faculty in appropriate departments at West Virginia University.

The doctoral student's plan of study and research will be guided by the student's advisory committee. Course work will consist of seminar each semester and electives as directed by the student's advisory committee. After satisfactory completion of all general and specialty course work requirements, the student must successfully complete a preliminary qualifying examination to be admitted to candidacy for the doctor of philosophy degree.

The preliminary qualifying examination, the most rigorous and comprehensive examination that the student must take, will be given at the discretion of the student's advisory committee and must be completed by the end of the second year or 48 credit hours after full admission into the doctoral degree program. This examination will consist of both written and oral portions.

After admission to candidacy and completion of course work and research, the student must prepare and successfully defend in a final examination a dissertation of his/her research. Satisfactory performance on the examination requires approval by five members of the student's advisory committee, which then recommends award of the doctor of philosophy degree.

To receive a degree, all students in the biomedical sciences graduate program must have a scholastic grade-point average of not less than 3.0 (B) in all graduate work completed in the program. All grades of C or less are counted in computing averages, but no more than 6 credit hours of C, and no credit hours below C, may be applied toward degree requirements. Credit/No Credit hours may be included toward degree requirements, but they will not affect the quality grade-point computation.

Residence

The doctoral program will normally require two and a half to three years of full-time graduate work beyond the M.S. degree. This must include a minimum of two semesters of residence in full-time graduate study at Marshall University. In addition, all doctoral students in this program,

regardless of receipt of financial assistance, must participate in the teaching and research programs as an integral part of their advanced training.

Research

Experimental neurobiology, neuroanatomy and neurophysiology of sensory/motor pathways, cellular neurophysiology, molecular biology, lipid metabolism, cancer biochemistry, estrogen receptors in human breast cancer, diabetes, molecular virology, molecular genetics, pathogenic microbiology, microbial physiology, immunoregulation, toxicology, biochemical pharmacology, cardiovascular and pulmonary physiology and pharmacology, sleep physiology, endocrinology, temperature regulation and postburn metabolism, sensory transduction and ion channel regulation.

Courses of Instruction

For courses of instruction, see the *Marshall University Graduate School Catalog*; contact the Office of Admissions, Marshall University, Huntington, WV 25701.

BUSINESS ADMINISTRATION

Jay H. Coats, Director of Graduate Programs

333 Business and Economics Building

College of Business and Economics, West Virginia University, P.O. Box 6025, Morgantown, WV 26506-6025

Telephone: (304) 293-5408

Degree Offered: Master of Business Administration

Graduate Faculty: Members Adams, Brewer, Coats, Cook, Cushing, Elkin, Fuller, Lane, Mann, Mansour, Mitchell, Ponzurick, Riley, Rose, Schaupp, Scherr, G. Smith, Speaker, and Wilson. Associate Members Abbott, Blakely, Blaskovics, Bone, Britt, Chow, Corey, Decker, Denning, Harpell, Lin, Logar, McClung, Martinec, Mautz, Neidermeyer, Pariser, Pushkin, Rupert, Shastri, Shaw, Speaker, Sypolt, Titard, and Wolfe.

The Master of Business Administration (M.B.A.) program is accredited by the American Assembly of Collegiate Schools of Business (AACSB) and is the only M.B.A. program in West Virginia so accredited. It is offered as a full-time, day-class program in Morgantown and as a part-time, weekend-class program in Morgantown, Shepherdstown, Wheeling, and Parkersburg. The standards of excellence that support accreditation by the AACSB are maintained at all instructional sites.

The M.B.A. degree program recognizes the need for a manager of the future to be able to anticipate and recognize change and then manage resources advantageously in that environment. Thus, the curriculum emphasizes a general, broad-based approach to graduate education in management which provides the student with the qualitative and quantitative skills necessary for a manager to succeed in such an environment. The program develops a managerial perspective that is primarily line as opposed to staff oriented and is relevant to those in both private and public organizations.

The plan of study requires a total of 48 semester hours of graduate credit. The program is designed for individuals with varying educational and professional backgrounds. No prior course work in business administration is required as a condition of admission to the program. No master's thesis is required for completion of the degree.

The M.B.A. degree program is completed in 13½ months of full-time study on the Morgantown campus. A full-time student can enter the program only on July 1 of each year and graduates in mid-August of the following year. Students may enter the part-time M.B.A. program in any semester. A minimum of two to three years is required for the part-time student to complete the program.

To gain admission into the Master of Business Administration (M.B.A.) program, an applicant must have a bachelor's degree in any field from an accredited institution and a grade-point average (GPA) of at least 3.0 either overall or in the last 60 hours of academic work completed. In addition, the applicant must have a minimum score on the Graduate Management Admission Test (GMAT) of at least 500. Applicants with a GPA below 3.0 (or GMAT scores below 500) must show correspondingly higher GMAT (or GPA) achievement. Depending on the number of qualified applicants, preference is given to those with GMAT scores above 540. Significant experience at increasing levels of responsibility and evidence of leadership potential (such as class officer) is given consideration. Such information should be summarized and attached to the application for admission. No action is taken on an application for admission until a GMAT score is submitted. Since GMAT is given only in January, March, June, and October, an applicant should take the test no later than March for July admission.

In addition to the above requirements, international student applicants are required to submit a "Test of English As a Foreign Language" (TOEFL) score in the range of 570-600 or above. International students may be required to take up to six hours of prerequisite course work in English as a foreign language, such as EFL 53, 54, or 55.

Applications for admission to the M.B.A. program and official transcripts of all prior academic work should be submitted to the WVU Office of Admissions and Records as early as possible. Applicants who have attended institutions other than WVU must request the registrar or records office of those institutions to forward a complete official transcript directly to the WVU Office of Admissions and Records. The deadline for receipt of applications and transcripts in the college's Office of Graduate Programs is one month prior to the starting date requested. Admission to the program is competitive and subject to space being available.

Financial Aid

A limited number of graduate assistantships and tuition scholarships are available on a competitive basis. Major selection criteria include the applicant's grade-point average in prior academic work and GMAT score. Graduate assistants are paid a cash stipend during the regular semesters that is competitive in amount with that offered by other universities; graduate assistants are assigned to faculty members to assist in research, teaching, and other academic endeavors. Additional scholarships are available on a competitive basis to minority students. Additional information and application forms can be obtained from the director of graduate programs.

Master of Business Administration (M.B.A.)

The M.B.A. degree program requires 48 hours of graduate credit, including the following courses:

Accounting 311—Financial Accounting for Decision Making

Accounting 321—Managerial Control

Business Law 311—Legal and Regulatory Environment

Economics 317—Economic Decision Making
Economics 318—Economic Policy
Economics 319—Applied Business and Economics Statistics
Finance 311—Managerial Finance
Finance 321—Corporate Financial Administration
Management 301—Organizational Behavior and Ethics
Management 303—Introduction to Management Science
Management 311—Management Information Systems
Management 321—Operations Management/Applied Quantitative Analysis
Management 325—Seminar in Organizational Processes
Management 351—Policy and Strategy
Marketing 311—Marketing Management
Marketing 321—Marketing Strategy
Seminar
Seminar

Selected graduate courses may be waived depending on an individual's undergraduate degree and the recency of the degree; however, other graduate courses must be substituted for waived courses.

The M.B.A. requires that the candidate achieve a cumulative grade-point average of at least 3.0 on all work counting toward the graduate degree. A Regular Graduate Student whose cumulative grade-point average falls below 2.75 will be placed on probation. If the average is not brought up to 2.75 by the end of the following semester, the student will be suspended from the program. A grade below C in any course taken while enrolled as a graduate student will result in suspension from the program. In addition, the student must maintain a 3.0 average in all work counting toward the graduate degree.

Students in the part-time program are subject to the same requirements and restrictions as students enrolled in the full-time program. Classes in the part-time program are taught by the same graduate faculty members as teach in the full-time program. The M.B.A. program is offered in its entirety at off-campus locations in Morgantown, Parkersburg, Shepherdstown, and Wheeling. There is no requirement that an off-campus student travel to Morgantown; however, weekend classes in Morgantown increase the number of courses available to off-campus students in any semester. Off-campus classes normally meet on Friday evenings (7:00 to 10:00) and Saturdays (9:00 a.m. to 2:00 p.m. or 9:00 a.m. to 4:00 p.m.). A three semester-hour course normally meets for five weekends and a two semester-hour course for three weekends. Part-time classes in Morgantown meet on Saturdays (9:00 a.m. to 4:30 p.m.) for six weekends (three semester-hour course) or four weekends (two semester-hour course). Part-time classes may have examinations scheduled on weekday evenings.

Complete information about the M.B.A. program may be obtained by contacting the Director of Graduate Programs.

Accounting (Acctg.)

210. **Advanced Accounting.** 3 hr. PR: Acctg. 112. Accounting for partnerships, consolidations, foreign exchanges, and governmental (nonprofit) entities.
211. **Accounting Systems.** 3 hr. PR: C.S. 5, Acctg. 112 or consent. Analysis of data-processing fundamentals and information systems analysis, design, and implementation, including necessary computer hardware and software components with particular reference to accounting information systems and the controls necessary therein.

213. *Income Tax Accounting*. 3 hr. PR: Acctg. 111 or 115 or 116 or consent. Tax laws and the investment and business decisions they affect. Taxes are presented in meaningful relationships in order to form a general pattern of knowledge that is easier understood.

214. *Income Tax Accounting*. 3 hr. PR: Acctg. 213 or consent. The study of federal income tax treatment of partnerships, corporations and estates, and the treatment of those property transfers subject to the Federal Gift Tax, together with an introduction of tax research and tax procedure.

217. *Auditing Theory*. 3 hr. PR or Conc.: Acctg. 210. Auditing fundamentals; objectives, ethics, statistical samplings, standards and procedures. Emphasis on FASB and SAS disclosures.

230. *Advanced Accounting Theory*. 3 hr. PR: Acctg. 112, 115, and consent. Critical analysis of accounting concepts and standards with emphasis on their origin, development, and significance.

311. *Financial Accounting for Decision Making*. 3 hr. PR: Consent. Basic accounting assumptions and standards underlying financial statements, the significance of financial statement measurements, and the relevance of such data for planning and control. Emphasis on financial statement and cash-flow analysis.

321. *Managerial Control*. 2 hr. PR: Acctg. 311 or consent. Managerial accounting concepts and techniques used for planning and control. Interpretation and use of internal accounting reports. The use of accounting information in decision making. Emphasis on development of an effective management control system.

325. *Accounting Information Systems*. 2 hr. PR: Consent. The design and use of computerized accounting information systems to support the transaction processing, reporting and decision-making systems of most organizations, including the use and critical analysis of currently available accounting packages.

330. *Financial Accounting Theory and Practice*. 3 hr. PR: Acctg. 112. Comprehensive examination of financial accounting theory as established by the opinions, statements and interpretations of professional organizations with special emphasis on their application and problem solving.

332. *Governmental and Nonprofit Accounting*. 3 hr. PR: Acctg. 112. Fund accounting and control in governmental and nonprofit entities; identification and control of cost centers; cost analysis and cost centers; cost analysis and cost finding, and planning and control of operations and resources.

333. *Income Taxes and Business Decisions*. 3 hr. PR: Acctg. 213. Advanced federal income-tax problems with emphasis on tax planning for business decisions and tax research methodology.

335. *Computer Systems Auditing*. 2 hr. PR: Acctg. 325. The analysis and design of control systems in a computerized accounting environment. Special emphasis on evaluating evidence to determine whether a computing system safeguards assets and maintains data integrity.

338. *Controllership*. 3 hr. PR: Manag. 304. Examination of the role of the controller in large entities in planning, measuring, evaluating, and controlling performance and in reporting to stockholders and governmental agencies.

340. *Reporting Practices and Problems*. 3 hr. PR: Consent. Evaluation of financial reporting practices and trends, including an examination of the reporting requirements of the SEC and other regulatory agencies. Practitioners will be used extensively for class discussion and presentations.

345. *Auditing and Professional Accounting Standards*. 3 hr. PR: Acctg. 217. Professional objectives, principles, and standards of auditing; audit reports and related communications; and case studies of audit sampling, professional ethics, legal liability and reporting.

349. Seminar in Accounting. 3 hr. PR: Consent.

491. Advanced Study. 1-6 hr.

Business Law (B. Law)

200. Special Topics. 1-4 hr. PR: B. Law 112 or consent. Special topics relevant to business law. (Maximum of 9 semester hours in any or all courses numbered 200 offered by the College of Business and Economics may be applied toward bachelor's and master's degrees.)

211. Personnel Relations and the Law. 3 hr. The legal principles guiding employer-employee relations, including agency law and the law regulating employee health, safety, compensation and benefits, job opportunity, and labor organizing.

311. Legal and Regulatory Environment. 2 hr. PR: Consent. Examination of the legal environment in which business decisions are made and the response of the legal environment to change. Familiarization with the role of administrative agencies in the regulatory process.

491. Advanced Study. 1-6 hr.

Economics (Econ.)

317. Economic Decision Making. 2 hr. PR: Econ. 54 or consent. (Primarily for M.B.A. students.) Analysis of the firm as an optimizing unit operating in the market place. Examination of product demand, production and costs, pricing theory and practices, risk, and capital budgeting.

318. Economic Policy. 2 hr. PR: Econ. 317 or consent. (Primarily for M.B.A. and M.P.A. students.) Microeconomic analysis of macroeconomic phenomena is considered with particular attention paid to the reaction by firms to price and interest rate effects of fiscal and monetary policy.

319. Applied Business and Economics Statistics. 3 hr. PR: Consent. Primary statistical methods used in business and economics research including hypothesis testing, estimation, linear regression, time series, and business forecasting. Statistical computer software is an integral part of the course.

Finance (Fin.)

212. Working Capital Management. 3 hr. PR: Fin. 111 or 311, Fin. 112, Econ. 125. Management of current assets and liabilities. Topics include management of cash, marketable securities, accounts receivable, inventories, trade accounts payable, and short-term bank borrowings. Decision models are used extensively.

216. Risk Management. 3 hr. PR: Fin. 115 or consent; PR or Coreq.: Fin. 112. Transferable risks with which the entrepreneur must deal. Emphasis on the process by which decisions are made for handling these risks, including an examination of contributions and limitations of insurance system.

217. Employee Benefit Plans. 3 hr. PR: Fin. 115 or consent. Use, design, and regulation of group life insurance, health care and pensions, including their federal tax consequences. Study of the available contracts in each area and financing alternatives and practices.

218. Life insurance and Estate Planning. 3 hr. PR: Fin. 115. Principles of life and health insurance protection; application of life insurance to individual, family, business, and societal needs; study of trusts, wills, and estates, integrating of income into estate management.

219. *Property and Liability Insurance.* 3 hr. PR: Fin. 115. Study of the use and production of property and liability insurance, including evaluation of insurance contracts and current insurance practices; legal and regulatory environment affecting use and production of insurance.

220. *Social Insurance.* 3 hr. PR: Fin. 115 or consent. Our social and political efforts to provide economic security for the general public. An examination of the parallel developments of private insurance.

250. *Security Analysis and Portfolio Management.* 3 hr. PR: Fin. 150 or consent; PR or Coreq.: Fin. 112. The systematic selection, assessment, and ranking of corporate securities in a portfolio framework through a synthesis of fundamental analysis, technical analysis, and random walk.

252. *Bank Management.* 3 hr. PR: Fin. 251 or consent. An advanced course in commercial banking involving problems of management of the money position, loan and investment portfolio, and capital adequacy. The student simulates actual bank operation, conducts case studies, and analyzes bank performance.

261. *Real Estate Appraising.* 3 hr. PR: Fin. 161. The appraisal problem, plan the approach, acquire, classify, analyze and interpret data into an estimate of value by the cost or replacement approach, income approach and market approach.

262. *Real Estate Finance.* 3 hr. PR: Fin. 111 or Fin. 311, Fin. 161, or consent. How financing, the tax system, and supply and demand interact to create values which, when coupled with investment decision, leads to choosing an investment strategy in real estate.

263. *Real Estate Investments/Land Development.* 3 hr. PR: Fin. 161 or consent. Designed to investigate various types of real estate investments including apartments, office buildings, shopping centers, and residential land developments with emphasis on financial analysis, profitability analysis, and rates of return.

311. *Managerial Finance.* 2 hr. PR: Consent. Analysis of the standard financial activities of the firm including: financial planning, structure of financing, and asset selection. Introduction to microcomputer problem solution.

321. *Corporate Financial Administration.* 3 hr. PR: Fin. 111, or Fin. 311, or consent. A study of theoretical concepts of corporate financial administration and the application of these concepts to real world case studies.

331. *Bank Management.* 3 hr. PR or Coreq.: Fin. 311 or consent. (May not be taken for both undergraduate and graduate credit.) Management of bank funds. Principles of organization lending and investment. Policy relationships to bank productivity, organization, and profitability; preparation of financial reports; management of a simulated bank in a changing environment. (Same as Fin. 251 with the addition of a research paper.)

349. *Seminar in Finance.* 3 hr. PR: Fin. 321.

491. *Advanced Study.* 1-6 hr.

Industrial and Labor Relations (ILR)

262. *Collective Bargaining and Labor Relations.* 3 hr. Examination of the theory and practice of collective bargaining. Topics include economics and historical environment, labor law, unionization, contract negotiation, patterns in contract content, conflict resolution, grievance handling, and an introduction to arbitration.

301. *Industrial Relations Analytical Techniques 1.* 3 hr. PR: Admission to the ILR graduate program and C.S. 5 or equiv. Introduction to the software and hardware appropriate for use in human resource applications, emphasizing efficient and effective use of previously developed software. Introduction to quantitative analytical decision-making techniques.

302. *Industrial Relations Analytical Techniques* 2. 3 hr. PR: Admission to the ILR graduate program. Further development of the quantitative analytical techniques and of business information systems used in the human resources field. Emphasis on quantitative decision-making and information systems in an industrial relations setting.

311. *Management Information Systems*. 3 hr. PR: Consent. Examines computer technology, applications, information systems, and performance. Computer system planning, selection and implementation. Computer impact upon management, organization and society from a managerial viewpoint.

310. *Human Resources Economics*. 3 hr. PR: Admission to the ILR graduate program. Consideration of the conditions of employment and unemployment at both macro and micro levels under varying degrees of competition, including the process of labor force preparation, labor market data and policy.

312. *Organizational Theory, Behavior, and Communication*. 3 hr. PR: Consent. Emphasis on the communication processes involved in problem resolution including organizational decision making. Problems include organizational evaluation methods, training and leadership development, staffing, evaluation of proficiency of individuals, systems, and procedures.

314. *Industrial Relations Strategy and Policy*. 3 hr. PR: Consent. Explores the integrative dimensions of organizational policies and their relationship to the personnel and industrial relations function. Business ethics in the industrial relations function.

316. *Labor Organization Industrial Relations*. 3 hr. PR: Consent. Introduction to dynamics (adversary/cooperative) of industrial relations from a union viewpoint. Topics include conflict resolution, union government, alternatives to economic conflict bargaining, interaction, the state of industrial relations and work society.

330. *Compensation Issues*. 3 hr. PR: Consent. Seminar in compensation designed to develop further understanding of compensation theory and practice. Topic areas will include labor supply, wage theory, legal constraints, motivation, equity theory, organizational development as well as compensation structure and administration.

332. *American Trade Unionism*. 3 hr. PR: ILR 262 or 316 or consent. Examines the rise of American unionism and traces historical factors shaping its philosophy. Topics include economic conditions and union history, comparisons of AFL and CIO structures and the AFL-CIO as a government.

333. *Seminar: Quality of Work Life*. 3 hr. PR: Consent. Analysis of current trends and approaches in "quality of work life improvement" with special attention to developments in participative management, job enrichment and gain sharing. Results of current research are featured.

334. *Work Group Dynamics and Leadership*. 3 hr. PR: Consent. Small group or individual research on topics related to leadership and group dynamics in the work environment including training and other human relations programs.

337. *Practicum in Industrial Interviewing*. 3 hr. PR: I.R. 312 and consent. Experiential learning of industrial interviewing techniques covering legal and technical aspects of employment interviewing and other types of interviewing.

340. *Arbitration Theory and Practice*. 3 hr. PR: ILR 262 and consent. Study of the purpose of arbitration, trends, principles of contract construction, hearing procedure evidence, remedies, training and education of arbitrators, training of advocates, and decision writing. Students will arbitrate mock cases.

342. *Advanced Collective Bargaining*. 3 hr. PR: ILR 262 or consent. Development of the economic theory, empirical analysis and policy implications of the impact of collective bargaining on wages, employment, market structure, and prices.

344. Benefits. 3 hr. Considers employee benefits from the perspective of the industrial relations specialist who is responsible for articulating and administering a corporate program. Includes study of all benefits covered by major federal legislation.

345. *Equal Employment Opportunity Problems.* 3 hr. PR: Consent. A series of lectures by specialists in equal employment opportunity affairs. Lecturers will include attorneys, directors of state and national EEO agencies, and representatives of business and industry and the labor movement.

491. Advanced Study. 1-6 hr.

497. Research. 1-15 hr.

Management (Manag.)

201. *Business Information Systems.* 3 hr. PR: Manag. 101 and 105 or consent. Use of EDP for management control and decision making with emphasis on application in the functions of finance, marketing, personnel, accounting, and operations management. 3 hr. lec.

206. *Organizational Theory and Analysis.* 3 hr. PR: Manag. 105 or consent. Influences of structure on the behavior and dynamics of the business organization. Attention on how to be an effective manager.

211. *Advanced Production Management.* 3 hr. PR: Manag. 111. Integration of quantitative techniques and their application to production problems. Utilizes cases and projects.

212. *Management Science. I.* 3 hr. PR: Manag. 105. The study and application of quantitative methods to business problems in which deterministic conditions prevail.

216. *Personnel Management.* 3 hr. PR: Manag. 105. Fundamental principles and practices related to the procurement, development, maintenance and utilization of human resources. Focus on areas such as human resource planning, selection, training, performance appraising, compensation, safety and health, and labor relations.

217. *Personnel and Compensation.* 3 hr. PR: Manag. 216 or consent. Designing and implementing total compensation systems in both private and public sectors. The emerging elements of total compensation systems are included providing insights into problems and opportunities for personnel.

222. *Management Science. II.* 3 hr. PR: Manag. 212 or consent. The study and application of quantitative methods to business problems in which probabilistic conditions prevail.

230. *Entrepreneurship.* 3 hr. PR: Consent. The role of the entrepreneur in business and society; includes an analysis of the individual entrepreneur, and investigates the nature and problems of establishing a new business enterprise.

260. *Practicum in Small Business.* 3 hr. PR: Consent. A practical training ground in the identification and solution of small business problems. Through interaction with the business community, students are exposed to the opportunities and difficulties of small business entrepreneurship.

301. *Organizational Behavior and Ethics.* 3 hr. PR: Consent. Interpersonal relationships through which administration becomes effective. Emphasis on human factors, but influences of economic and technological factors also are considered. Focus on ethics and importance of harmony between individual needs and organization goals.

303. *Introduction to Management Science.* 3 hr. PR: Consent. Study of management science models and techniques with applications in business decision making problems. Coverage includes mathematical programming models, decision theory, simulation, network models, and other current management science topics.

311. *Management Information Systems.* 3 hr. PR: Consent. Examines computer technology, applications, information systems, and performance. Computer system planning, selection and implementation. Computer impact upon management, organization, and society from a managerial viewpoint.

321. *Operations Management/Applied Quantitative Analysis.* 3 hr. PR: Consent. Review of concepts, techniques, and models encountered in manufacturing and service operations. Modeling approach and computer applications in operations management and management science are emphasized.

325. *Seminar in Organizational Processes.* 3 hr. PR: Consent. Examination of the dynamics of the successful organization. Emphasis on the organization as an institution and the role of the manager in the organization. Implications of international competition will be addressed.

349. *Seminar in Management.* 1-6 hr. PR: Consent. In depth study of important management issues

351. *Policy and Strategy.* 3 hr. PR: Consent. Capstone course. Integrates functional knowledge with strategy formulation and strategy implementation concepts. Cases of organizations varying in size, national affiliation, and profit orientation are analyzed with special emphasis on ethics and social responsibility.

491. *Advanced Study.* 1-6 hr.

Marketing (Mrktg.)

203. *Sales Management.* 3 hr. PR: Mrktg. 114 or consent. Concentrates on the managerial responsibilities of sales managers for directing, motivating, and controlling a sales force plus the techniques of selling including handling objections and closing.

205. *Consumer Behavior.* 3 hr. PR: Mrktg. 111 or consent. The consumer decision process in a marketing framework. Emphasis on psychological and sociological concepts which influence the decision process.

207. *Business Logistics Management.* 3 hr. PR: Mrktg. 115 or consent. Examination of transportation, warehousing, materials handling, containerization, inventory control, purchasing, and warehouse location. Significant use made of problem solving with analytical tools.

210. *Industrial Marketing.* 3 hr. PR: Mrktg. 111 or consent. A study of marketing to three classes of customers: the industrial market, the institutional market, and governmental agencies.

311. *Marketing Management.* 2 hr. Introduction to marketing management with specific emphasis on consumer behavior and market segmentation, product planning, promotion, distribution, and pricing.

321. *Marketing Strategy.* 3 hr. PR: Mrktg. 311. Emphasis on formulating a marketing strategy and developing analytical and decision-making capabilities. Cases will be used to illustrate specific business situations.

349. *Seminar in Marketing.* 3 hr.

491. *Advanced Study.* 1-6 hr.

CHEMICAL ENGINEERING

E. V. Cilento, Chairperson

425 Engineering Sciences Building

Degrees Offered: Master of Science in Chemical Engineering

Chemical Engineering Areas of Emphasis available for:

Master of Science in Engineering, Doctor of Philosophy

Graduate Faculty: Members Bailie, Cilento, Dadyburjor, Kono, Kugler, Shaeiwitz, Stiller, Turton, Whiting, Yang, and Zondlo.

The Department of Chemical Engineering, with 11 faculty members, 75 undergraduates, and over 30 graduate students, has one of the oldest doctoral-granting programs in the University. From the initial doctoral degree in 1932, the graduate course program has been based on advanced chemical engineering fundamentals, while the research program has reflected a balance of fundamental research areas and their application to relevant technological areas such as coal conversion.

Chemical engineering faculty are presently involved in the following research areas: biochemical engineering, bioengineering, catalysis, fluid mechanics, heat transfer, mathematical modeling and simulation, reaction engineering, separation processes, solution chemistry, and thermodynamics. These fundamental areas are finding applications in biomass conversion technology, blood flow, coal gasification and liquefaction, *in-situ* combustion, and synthetic fuels.

Faculty members possess a wide variety of industrial experience and are routinely in contact with their counterparts in industry. This contact with real engineering problems enables them to convey a practical experience to students while keeping in perspective many of the fundamental concepts involved in the graduate program.

During the last ten years, the chemical engineering faculty have authored or co-authored seven books, published 240 journal articles, have been issued 12 patents, made 205 presentations at professional meetings, and supervised the completion of 66 master's and 33 doctoral degrees. In addition, several faculty members have written textbooks and taught short courses throughout the United States.

The department is authorized to admit students to the following degree programs: Master of Science in Chemical Engineering (M.S.Ch.E.), Master of Science in Engineering (M.S.E.), and College of Engineering interdisciplinary Doctor of Philosophy (Ph.D.). Students in these programs must comply with the rules and regulations as presented in the general requirements for graduate work in the College of Engineering and in the Department of Chemical Engineering. Students interested in pursuing work for a master's or doctoral degree in chemical engineering should contact the department for copies of the required guidelines. Students should refer to Part 2 of this catalog for a general description of the graduate programs in engineering.

Master of Science in Chemical Engineering (M.S.Ch.E.)

Master of Science in Engineering (M.S.E.)

Admission Requirements. Admission to the M.S.Ch.E. program is restricted to those holding a baccalaureate degree in chemical engineering or its equivalent. The M.S.E. program is available to students holding baccalaureate degrees in other fields of engineering and the physical sciences who wish to pursue a broad interdisciplinary program relevant to the major graduate areas administered by the department.

To be admitted as a regular graduate student, an applicant must have a B.S. degree and a sound record in previous college work with a minimum 3.0/4.0 cumulative grade-point average. Applicants who cannot meet these conditions may be considered for admission in a conditional category (see Part 2 of this catalog). Students admitted with deficiencies in their undergraduate programs are required to take some chemical engineering courses as prerequisites for graduate courses. These requirements are stated as a condition for admission.

M.S.Ch.E. candidates should expect to obtain their degree in about 18 months. M.S.E. students typically require one to one-and-a-half years beyond completion of prerequisite courses.

All M.S. degree candidates are required to perform research and will follow a planned program which conforms to either of the following outlines:

1. A minimum of 30 semester credit hours, excluding seminar, not more than six of which are in research leading to an acceptable thesis.

2. A minimum of 33 semester credit hours, excluding seminar, not more than three of which are in research leading to an acceptable problem report.

The non-thesis M.S. degree option is not offered by the Department of Chemical Engineering.

Courses. All students are required to take Ch.E. 301, 344, and 345, and all full-time students are required to take one credit of journal club/seminar (Ch.E. 400) for each semester enrolled. The research adviser, in conjunction with an advisory and examining committee (AEC) to be designated by each student, will be responsible for following departmental guidelines to determine the plan of study appropriate to the student's program.

Research Proposal. A written research proposal and oral presentation of this proposal is required of all M.S. students. This oral defense is administered by the student's AEC and must be completed by the end of the second semester of the first year for M.S.Ch.E. candidates, and as soon as possible but not later than the end of the second semester of the second year for M.S.E. candidates.

Final Examination. All students are required to pass a final oral examination, administered by their AEC, covering both the thesis or problem report (depending on the program selected) and related course material.

Doctor of Philosophy (Ph.D.)

A candidate for the degree of Doctor of Philosophy in the Ph.D. program must comply with the rules and regulations as outlined in the general requirements for graduate work in engineering and the specific requirements stated in the departmental guidelines. Students who are interested in pursuing a Ph.D. degree in the Department of Chemical Engineering should contact the department for specific information about the interdisciplinary Ph.D. degree program. (See also Part 2 of this catalog.) A program with a major in chemical engineering, designed to meet the needs and objectives of each student, will be developed in consultation with the student's research adviser and advisory and examining committee (AEC). It should be emphasized that the Ph.D. degree is primarily a research degree and therefore the research work for a doctoral dissertation should show a high order of originality on the part of the student and must offer an original contribution to the field of engineering science.

Admission Requirements. Admission to the Ph.D. program is open to students who qualify as regular graduate students (see Part 2 of this catalog) and who have obtained a B.S. or M.S. degree in science or engineering. Students admitted must have demonstrated an excellent academic record in previously completed college course work with a minimum cumulative grade-

point average of 3.0/4.0. Three letters of recommendation are required, and GRE scores may be requested by the department. Students who enter the Ph.D. program should complete the requirements in two to four years.

Course Requirements. All B.S. students entering the Ph.D. program are required to take Ch.E. 301, 344, and 345, while M.S. students entering the program must demonstrate equivalent courses taken for graduate credit in their previous work. In addition, all full-time students must take one credit of seminar/journal club (Ch.E. 400) each semester. For a student admitted directly after the B.S. degree, the Ph.D. program consists of a minimum of 36 course credit hours, excluding research (Ch.E. 497) and seminar/journal club (Ch.E. 400). If the student has a M.S. in chemical engineering from WVU, the program consists of a minimum of 12 course credit hours (excluding Ch.E. 497 and Ch.E. 400). If the student has a M.S. in chemical engineering from another institution, the program consists of a minimum of 18 course credit hours (excluding Ch.E. 497 and Ch.E. 400). Students must complete a minor, consisting of a minimum of nine semester hours of a coherent set of courses taken outside the department. These courses may be related to the major research area. Non-technical courses would be considered only under exceptional circumstances. Courses at the 200-level may be acceptable. All courses must be approved by the AEC and the academic adviser. Students must complete graduate courses with an overall course work average of 3.0 or better (exclusive of research credits) and complete all Ch.E. courses with an overall grade-point average of 3.0 (exclusive of research credits). A minimum of 24 graduate credits in dissertation research is required. Also, two semesters of full-time attendance at West Virginia University, Morgantown campus, is required to complete the residency requirement.

Qualifying Examination. All students must pass the Ph.D. qualifying examination given in their first summer at WVU. This examination is designed to assess the basic competency of students in the chemical engineering field to determine if they have sufficient knowledge to undertake independent research.

Original Research Proposition. Within six months of passing the qualifying examination or of entering the Ph.D. program, whichever is later, the student must successfully defend an original research proposition in an oral examination. The written proposition, developed by the student alone, remains the intellectual property of the student and must be on a topic unrelated to the student's own research work for the dissertation.

Dissertation Research Proposal. A student must receive acceptance of a written dissertation research proposal and must also successfully defend this proposal to the student's AEC. This requirement must be completed within six months of passing the qualifying examination or of entering the Ph.D. program, whichever is later. The research work for the doctoral dissertation should show a high order of originality on the part of the student and must offer an original contribution to the field of engineering science.

Candidacy. A student who has successfully completed all course work, passed the qualifying examination, and successfully defended the original research proposition and research proposal is defined as one who is a candidate for the Ph.D. degree.

Final Examination. In order to complete the Ph.D. requirements, a student must pass a final oral examination on the results embodied in the dissertation. This examination is open to the public, and in order to evaluate critically the student's competency, may include testing on material in related fields, as deemed necessary by the AEC. In addition, since the Ph.D. degree is primarily

a research degree that embodies the results of an original research proposal and represents a significant contribution to the scientific literature, the student must submit a manuscript on this research to the AEC.

Chemical Engineering (Ch. E.)

212. *Biochemical Separations.* 3 hr. PR: Ch.E. 112 or consent. Modeling and design of separation processes applicable to recovery of biological products. Topics include filtration, centrifugation, extraction, adsorption, chromatography, electrophoresis, membranes, crystallization, examples from industry. 3 hr. lec.

224. *Process Development.* 3 hr. PR: Chem. 134, 144; Ch. E. 111, 145, or consent. Coal conversion process systems from the modified unit operations-unit process concept. Thermodynamics and kinetics in evaluation of system requirements and performance. 3 hr. rec.

258. *Polymers and Polymer Processing.* 3 hr. PR: Chem. 134, Ch. E. 110. Polymers and their handling. Properties of macromolecules as influenced by molecular weight, polymerization methods, plastics technology, polymer engineering, polymerization kinetics, polymer characterization, commercial production processes, injection molding processes, blow molding and composites. 3 hr. lec.

265. *Interfacial Phenomena.* 3 hr. PR: Ch.E. 145, Chem. 246 or consent. Processes occurring at fluid/fluid and fluid/solid interfaces. Interfacial tension, contact angle, wetting, transport phenomena near interfaces, properties and stability of colloids, colloid transport phenomena, surfactants, micelles and emulsions. 3 hr. lec.

272. *Biochemical Engineering.* 3 hr. PR: Ch.E. 172 or consent. Kinetics of enzymatic and microbial reactions, interactions between biochemical reactions and transport phenomena, analysis and design of bioreactors, enzyme technology, cell cultures, bioprocess engineering. 3 hr. lec.

280. *Chemical Engineering Problems.* 1-6 hr. For juniors, seniors, and graduate students. May be used to correct deficiencies preparatory to or following courses such as Ch. E. 182 and 183, or for other students desiring to take only a portion of a course.

301. *Transport Phenomena.* 3 hr. PR: Consent. Introduction to equations of change (heat, mass and momentum transfer) with a differential balance approach. Use in Newtonian flow, turbulent flow, mass and energy transfer, radiation, convection. Estimation of transport coefficients. 3 hr. rec.

330. *Process Dynamics and Control.* 3 hr. PR: Consent. Dynamic response of processes and control instruments. Use of Laplace transforms and frequency response methods in analysis of control systems. Application of control systems in chemical reactors, distillation, and heat transfer operations. Introduction to nonlinear systems. 3 hr. rec.

331. *Mathematical Methods in Chemical Engineering.* 3 hr. PR: Math. 18 and consent. Classification and solution of mathematical problems important in chemical engineering. Treatment and interpretation of engineering data. Analytical methods for ordinary and partial differential equations including orthogonal functions and integral transforms. Vector calculus.

338. *Advanced Numerical Methods.* 3 hr. PR: Ch.E. 38 or consent. Methods for nonlinear algebraic equations, methods for initial and boundary value ordinary differential equations, methods for parabolic, hyperbolic, and elliptic partial differential equations, numerical stability and methods for stiff equations, curve fitting techniques, optimization techniques. 3 hr. lec.

344. *Thermodynamics.* 3 hr. PR: Consent. Logical development of thermodynamic principles. These are applied to selected topics including development and application of the phase rule, physical and chemical equilibria in complex systems, and nonideal solutions. Introduction to nonequilibrium thermodynamics. 3 hr. rec.

345. *Chemical Reaction Engineering.* 3 hr. PR: Consent. Homogeneous reactions, batch and flow reactors, ideal reactors, macro and micro mixing, nonideal flow reactors, heterogeneous reaction systems, catalytic and noncatalytic reactions, reactor stability analysis, reactor optimization. 3 hr. rec.

351. *Fluidization Engineering.* PR: Consent. Fundamentals of fluidization, two-phase flow theory and powder characteristics, structure and property of the emulsion phase and bubbles, mass- and heat-transfer in fluidized beds with and without chemical reaction.

352. *Powder Technology.* 3 hr. PR: Consent. Characterization of powders, structure of powders, powders in two phase flow, measurement techniques, static and dynamic behavior of powders, grinding and agglomeration, chemistry of powders. (3 hr. lec.)

371. *Advanced Separation Processes.* 3 hr. PR: Ch. E. 301 or consent. Design and selection of separation processes including crystallization, leaching, extraction, distillation, absorption, filtration, membrane, and diffusional separation processes. Similarities between separation processes based on mode of operation are emphasized.

391. *Advanced Topics.* 3 hr. PR: Consent. Investigation of topics not covered in regularly scheduled courses.

400. *Chemical Engineering Seminar.* 1 hr. Seminars on current research by visitors and graduate students.

402. *Advanced Fluid Dynamics.* 3 hr. PR: Consent. Analysis of flow of fluids and transport of momentum and mechanical energy. Differential equations of fluid flow; potential flow, flow in porous media, laminar boundary layer theory, and non-Newtonian fluids. 3 hr. rec.

404. *Advanced Heat Transfer.* 3 hr. PR: Consent. Theory of transport of thermal energy in solids and fluids as well as radiative transfer. Steady and transient conduction; heat transfer to flowing fluids; evaporation; boiling and condensation; packed and fluid bed heat transfer. 3 hr. rec.

406. *Advanced Mass Transfer.* 3 hr. PR: Consent. Theory of diffusion, interphase mass transfer theory, turbulent transport, simultaneous mass and heat transfer, mass transfer with chemical reaction, high mass transfer rates, multicomponent macroscopic balances. 3 hr. rec.

432. *Optimization of Chemical Engineering Systems.* 3 hr. PR: Consent. Optimization in engineering design, unconstrained optimization and differential calculus equality constraints optimization, search technique, maximum principles, geometric and dynamic programming, linear and nonlinear programming, calculus of variations. 3 hr. rec.

444. *Applied Statistical and Molecular Thermodynamics.* 3 hr. PR: Ch.E. 344 and consent. The connection between macroscopic phenomena (thermodynamics) and microscopic phenomena (statistical and quantum mechanics). Thermodynamics modeling for process analysis. Equations of state, perturbation theories, mixing rules, computer simulation, group contribution models, physical property prediction.

446. *Catalysis*. 3 hr. PR: Ch. E. 345 or consent. Physical and chemical properties of catalytic solids, nature and theories of absorption, thermodynamics of catalysis, theories of mass and energy transport, theoretical and experimental reaction rates, reactor design and optimization. 3 hr. rec.

447. *Non-Catalytic Solid-Fluid Reactions*. 3 hr. PR: Ch. E. 345 or consent. Reaction models, pseudo-steady approximation, effectiveness factor, transport and chemical reaction properties, geometric, thermal and transitional instabilities, simultaneous multiple reactions, selectivities in fixed, moving and fluidized bed reactor design. 3 hr. rec.

480. *Advanced Independent Study*. 1-6 hr. PR: Consent. Designed to increase the depth of study in a specialized area of chemical engineering.

491. *Special Topics*. 3 hr. PR: Consent. Investigation of advanced topics not covered in regularly-scheduled courses. Recent topics have included: Biochemical Engineering, Fluidization, Mathematical Methods, Numerical Methods, Powder Technology, and Surfaces and Colloids.

497. *Research*. 1-15 hr.

CHEMISTRY

Anthony Winston, *Chairperson of the Department*
222 Clark Hall or 471 Chemistry Research Laboratory

Degrees Offered: Master of Science
Doctor of Philosophy

Graduate Faculty: Members Dalal, Finklea, Fodor, Gibson, Jaffe, Jagodzinski, Lovett, MacDowell, Magriots, Nakon, Penn, Petersen, Showalter, Smart, Stolzenberg, Wang, and Winston. Associate members Moore and Muth.

The Department of Chemistry offers graduate studies leading to the degrees of Master of Science and Doctor of Philosophy with research concentration in the areas of analytical, inorganic, organic, physical, and theoretical chemistry. The Master of Science and Doctor of Philosophy degrees require completion of a research project that represents the principal components of the graduate program.

Applicants for graduate studies in chemistry must have a bachelor's degree as a minimum requirement. Applicants must have a major or concentration in chemistry and an appropriate background in physics and mathematics. All entering graduate students in chemistry are required to take departmental guidance examinations in the major areas of chemistry. These examinations, on the undergraduate level, are administered before registration and serve to guide the faculty in recommending a course program for the beginning graduate student. Deficiencies revealed on the departmental guidance examinations need to be corrected in a manner prescribed by the faculty. All graduate students pursuing M.S. and Ph.D. degrees in chemistry are required to teach in the instructional laboratories for a minimum of two semesters.

The WVU general requirements for the Master of Science degree are outlined in Part 5 of this catalog. Graduate students in the M.S. program in chemistry are required to submit a research thesis. They may apply up to six hours of research credit toward the 30-hour requirement. The remaining 24 hours of credit must be earned in the basic graduate courses that reflect a diversified exposure to chemistry; no more than nine hours of 200-level chemistry courses may be included; no more than ten hours may be elected outside the department; and course work taken at the 300 to 400-level must include at least three, three credit-hour courses distributed in two of the three

areas of chemistry outside the student's major area of research. A final oral examination is administered after completion and submission of the thesis.

The program for the degree of Doctor of Philosophy reflects a flexible, research-oriented approach geared to develop the interests, capability, and potential of students. A program of courses is recommended to suit individual needs based on background and ability. These courses are classified as basic graduate courses, which present the essentials of a given discipline on an advanced level, and specialized graduate courses that take one to the frontiers in a specific area of research. The course offerings are designed to provide guidelines from which students can launch their independent studies in preparation for candidacy examinations. Students are required to enroll in the departmental seminar program and are expected to attend special lectures and seminars offered by visiting scientists.

Graduate students in the Ph.D. program are required to complete satisfactorily a minimum of three courses (three credits each) at the 300-400-course level, offered by the Department of Chemistry and distributed in two areas outside their major area of research. In addition, each major area in chemistry requires students in that area to enroll in basic graduate courses presenting the essentials of that discipline on an advanced level.

Candidacy examinations contain written and oral portions. The written examinations are of the cumulative type, and are offered eight times a year. The oral examination is based on a proposition for a research problem not intimately related to the student's own project, or any particular research project being actively pursued at WVU. This proposition is presented in writing to the student's research committee and defended before that group and any other interested faculty members.

Each candidate for the Ph.D. must satisfy a departmental language requirement in a language approved by the student's research committee.

Research, which is the major theme of graduate studies, may be initiated as early as the student and faculty feel it is appropriate. Normally, a student will begin research no later than the second semester of residence. Upon successful completion of an original piece of research, the candidate will present results in a Ph.D. dissertation and at the appropriate time defend the work in a final oral examination.

Chemistry (Chem.)

Note: A charge is made for breakage and supplies in laboratory courses and for failure to check out of the laboratory.

201. *Chemical Literature.* I. 1 hr. PR: Chem. 134 and Chem. 141 or 246. Study of techniques of locating, utilizing, and compiling information needed by the research worker in chemistry. 1 hr. lec.
202. *Selected Topics.* I, II. 1-3 hr. (May be repeated for credit.) PR: Written consent, with at least a 2.0 grade-point average in chemistry courses. Individual instruction under supervision of an instructor.
210. *Instrumental Analysis.* II. 2 hr. PR: Chem. 115 and physical chemistry. Lectures and demonstrations. Basic electronics, electrochemistry, spectroscopy, mass spectrometry and gas chromatography. 2 hr. lec., 1 hr. demonstration.
211. *Intermediate Analytical Chemistry.* I. 3 hr. PR: Chem. 115 and physical chemistry. Principles of analytical procedures and separations at an intermediate level. 3 hr. lec.

212. *Environmental Chemistry*. II. 3 hr. PR: Chem. 115, 134, and physical chemistry. Study of the nature, reactions, transport, and fates of chemical species in the environment.

213. *Instrumental Analysis Laboratory*. I. 1 hr. PR: Chem. 210. Experiments using modern chemical instrumentation. 3 hr. lab.

214. *Computer Interfacing Laboratory*. I. 1 hr. PR: Chem. 210; Conc.: Chem. 213. Computer interfacing of chemical instruments.

222. *Chemistry of Inorganic Compounds*. I. 3 hr. PR: Physical chemistry. Correlation of reactions and properties of elements and compounds based on modern theories of chemical bonding and structure. Acid-base theory, non-aqueous solvents, ligand field theory, and stereochemistry. 3 hr. lec.

235. *Methods of Structure Determination*. I. 4 hr. PR: Chem. 134 and 136. Use of chemical methods and uv, ir, nmr, esr, Raman and mass spectroscopy to elucidate structures of organic compounds. For students in chemistry and related fields who may need these methods in research and applied science. 2 hr. lec., two 3-hr. lab.

237. *Polymer Chemistry*. I. 3 hr. PR: Chem. 134 and physical chemistry. Methods, mechanisms, and underlying theory of polymerization. Structure and stereochemistry of polymers in relation to chemical, physical, and mechanical properties. 3 hr. lec.

239. *Organic Syntheses*. II. 3 hr. PR: Chem. 134, 136. Modern synthetic methods of organic chemistry. One 1-hr. lec., two 3-hr. lab.

241. *Crystallography*. II. 3 hr. PR or Conc.: Physical chemistry or consent. Applications of X-ray diffraction of crystals to the study of crystal and molecular structure. Includes theories of diffraction and crystallographic methods of analysis. 3 hr. lec. (Not offered in 1990-91.)

243. *Introduction to Radiochemistry and Radiation Chemistry*. I. 3 hr. PR or Conc.: Physical chemistry. Fundamentals of radiochemistry and the use of tracer techniques. An introduction to radiation chemistry and how ionizing radiation interacts with matter. 2 hr. lec., 3 hr. lab. (Not offered in 1990-91.)

244. *Colloid and Surface Chemistry*. II. 3 hr. PR: Physical chemistry. Selected topics in the properties and physical chemistry of systems involving macromolecules, lyophobic colloids, and surfaces. 3 hr. lec. (Not offered in 1990-91.)

246. *Physical Chemistry*. I. 3 hr. PR: Chem. 134, Math. 16, and Phys. 12. A first course in physical chemistry. Topics include a study of thermodynamics and chemical equilibria. 3 hr. lec. (Students may not receive credit for Chem. 246 and for Chem. 141.)

247. *Physical Chemistry Laboratory*. II. 1 hr. PR: Chem. 18 or 115 and Chem. 246. Experimentation illustrating the principles of physical chemistry and offering experience with chemical instrumentation. One 3-hr. lab.

248. *Physical Chemistry*. II. 3 hr. PR: Chem. 246 and Math. 17. Continuation of Chem. 246. Chemical dynamics and the structure of matter. 3 hr. lec. (Students may not receive credit for Chem. 248 and for Chem. 141.)

249. *Physical Chemistry Laboratory*. I. 2 hr. PR: Chem. 246, 247, 248. Continuation of Chem. 247. Two 3-hr. lab.

250. *Chemical Bonding and Molecular Structure*. I. 3 hr. PR: Chem. 248. Introduction to the quantum theory of chemical bonding. Atomic structure, theoretical spectroscopy, predictions of molecular structures and bond properties. 3 hr. lec.

315. *Chemical Separations*. 3 hr. PR: Chem. 115, 133, and physical chemistry. Modern methods of chromatography from a theoretical and practical standpoint. General principles of separation stressing the practical implementation of these principles with particular emphasis on high performance liquid chromatography and gas chromatography. 3 hr. lec. (Offered Spring 1990 and every third semester.)

331. *Advanced Organic Chemistry 1*. I. 3 hr. PR: Chem. 134. Structural concepts, bonding, tautomerism, static and dynamic stereochemistry, mechanistic classifications of reagents, and reactions including some applications. 3 hr. lec.

332. *Advanced Organic Chemistry 2*. II. 3 hr. PR: Chem. 331. Continuation of Chem. 331 with emphasis upon synthetic methods and reaction mechanisms. 3 hr. lec.

341. *Chemical Thermodynamics*. I. 3 hr. PR: Chem. 248. Principles of classical and statistical thermodynamics and their application to chemical problems. 3 hr. lec.

411, 412. *Seminar in Analytical Chemistry*. I, II. 1 hr. per sem. Current literature and research.

413. *Electrochemistry and Instrumentation*. I. 3 hr. PR: Chem. 210. Electronic instrumentation applied to study of mass transfer kinetics of electrode reactions, voltammetry, and high-frequency methods. 3 hr. lec. (Offered Spring 1991.)

414. *Spectroscopic Methods*. II. 3 hr. PR: Chem. 213. Problems in design of instruments for each of the various spectral regions. 3 hr. lec. (Offered Fall 1990.)

417, 418. *Advanced Topics in Analytical Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest.

421, 422. *Seminar in Inorganic Chemistry*. I, II. 1 hr. per sem. Current literature and research.

423. *Advanced Inorganic Chemistry*. I. 3 hr. PR: Chem. 222. Bonding theories, stereochemistry, nonaqueous solvent systems, physical methods and current topics. 3 hr. lec.

424. *Coordination Chemistry*. II. 3 hr. PR: Chem. 222. Ligand field theory, spectral interpretations, stability considerations, synthetic methods, unusual oxidation states, organometallic compounds, other topics of current interest. 3 hr. lec. (Offered Spring 1991.)

425. *Inorganic Reactions and Mechanisms*. I. 2 hr. PR: Chem. 222 and 443. Substitution, isomerization, racemization, and oxidation-reduction reactions. 2 hr. lec. (Offered Fall 1990.) Register for Chem. 427—1 hr.

427, 428. *Advanced Topics in Inorganic Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest.

431, 432. *Seminar in Organic Chemistry*. I, II. 1 hr. per sem. Current literature and research.

433. *Physical Organic Chemistry*. II. 3 hr. PR: Chem. 331. Theoretical considerations of organic molecules, kinetics and other methods used in the study of organic structure and reaction mechanisms, linear free energy relationship and other related topics. 3 hr. lec.

436. *Heterocyclic Chemistry*. I. 3 hr. PR: Chem. 331. Major heterocyclic systems and discussion of selected natural products containing heterocycles. 3 hr. lec. (Offered on demand.)

437, 438. *Advanced Topics in Organic Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest.

441, 442. *Seminar in Physical Chemistry*. I, II. 1 hr. per sem. Current literature and research.

443. *Chemical Kinetics*. I. 3 hr. PR: Chem. 248. Theories and applications of kinetics in gaseous state and in solution. 3 hr. lec.

444. *Statistical Mechanics*. I or II. 3 hr. PR: Chem. 446. Theory and application of statistical mechanics to chemical systems. 3 hr. lec. (Offered on demand.)

445. *Theoretical Chemistry 1*. I or II. 3 hr. PR: Differential equations. Theoretical background for quantum mechanics. 3 hr. lec.

446. *Theoretical Chemistry 2*. I or II. 3 hr. PR: Chem. 445. Theories and applications of quantum mechanics in chemistry. 3 hr. lec. (Offered on demand.)

447. *Molecular Spectroscopy and Structure*. II. 3 hr. PR: Chem. 250. Advanced applications of spectral methods to a study of molecular structure. 3 hr. lec.

448, 449. *Advanced Topics in Physical Chemistry*. I, II. 1-3 hr. per sem. Recent advances and topics of current interest. (Offered on demand.)

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

492. *Research Seminar*. I, II. 1 hr. PR: Graduate student in chemistry. Research seminars by visiting lecturers.

497. *Research*. I, II, S. 1-15 hr.

499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in academic and cultural programs.

CIVIL ENGINEERING

Sam A. Kiger, Chairperson

623 Engineering Sciences Building

Degree Offered: Master of Science in Civil Engineering

Civil Engineering Area of Emphasis available for

Master of Science in Engineering, Doctor of Philosophy

Graduate Faculty: Members Bowders, Chen, Davalos, Dean, Eck, Eli, GangaRao, Gidley, Gray, Head, Hota, Jenkins, Kiger, Luttrell, Moulton, Neumann, Sack, Siriwardane, and Spyarakos.

The Department of Civil Engineering offers the Master of Science in Civil Engineering in conjunction with the College of Engineering. The Master of Science in Engineering and the Doctor of Philosophy degrees are available with emphases in civil engineering.

The Department of Civil Engineering has a full-time faculty of 21, who are active in teaching, research, and service. There are four major areas of interest of the faculty and graduate studies:

1. Environmental engineering and hydrotechnology, which include air pollution, occupational health, solid-hazardous waste management, water supply and pollution, groundwater hydraulics, and hydrology.

2. Geotechnical and materials engineering, which covers soil mechanics, foundations engineering, soil-structure interaction, groundwater and seepage,

and earthwork design, as well as construction materials and waste product utilization.

3. Transportation engineering, which includes transportation systems principles, design, and planning.

4. Structural engineering, which involves work and study in advanced structural analysis, bridge engineering, and building design.

5. Through its Transportation System Rehabilitation and Maintenance Institute, the department also offers areas of emphasis in materials, diagnostics and nondestructive testing, composite materials, and structure rehabilitation.

With few exceptions, the members of the faculty are registered professional engineers in one or more states and are involved in state, regional, and national professional organizations, serving on numerous technical committees. They are successful researchers and have published extensively in various technical journals. The civil engineering faculty is concerned with the development of a professional engineer, able to assume the roles of a problem solver, decision maker, and technical leader, and with the educational background to undergird the continuing development required during an engineer's professional career.

Each graduate student can tailor a program of study to satisfy the student's own special interest. Opportunities abound within the master's and doctoral tracks for a research experience which provides a chance for a student to tackle an engineering problem individually, with guidance from a faculty adviser. The graduate program in civil engineering has been established with the philosophy of developing in the student the ability to use today's contemporary methods of engineering analysis and design so that they can solve tomorrow's engineering problems.

Master of Science in Civil Engineering (M.S.C.E.)

Master of Science in Engineering (M.S.E.)

Students must comply with rules and regulations as outlined in the general requirements for graduate work. Each candidate will, with the approval and at the discretion of the graduate committee, follow a planned program which must conform to one of the following outlines:

1. A minimum of 30 semester credit hours, not more than six of which are in research leading to an acceptable thesis.

2. A minimum of 33 semester credit hours, not more than three of which are in research leading to an acceptable problem report.

3. A minimum of 36 semester credit hours, with no thesis or problem report required.

Courses: No rigid curricula are prescribed for the degrees of Master of Science in Civil Engineering and Master of Science in Engineering. Graduate-level work in mathematics, mechanics, or other appropriate areas of science is customary; however, at least 15 semester hours of credit should normally be selected from graduate civil engineering courses.

Thesis or Problem Report. A thesis or problem is normally required of all candidates. While required credit in research (C.E. 497) is devoted to the thesis or report preparation, the thesis or problem report is not automatically approved after the required number of semester hours of research work have been completed. The thesis or problem report must conform with the general WVU requirements for graduate study and with any additional requirements established by the Department of Civil Engineering.

Final Examination. A candidate shall be required to pass an examination which may be written, oral, or both, to be administered by the student's

Approval for the M.S.C.E. degree is restricted to those holding a baccalaureate degree in civil engineering.

Master of Science in Engineering (M.S.E.)

The Master of Science in Engineering (M.S.E.) program is available to students approved for the graduate program who possess a baccalaureate degree in a technical area other than civil engineering. Students entering this graduate program must complete appropriate undergraduate work as specified by departmental regulations. This degree program is administered by the College of Engineering; the program may emphasize civil engineering.

Doctor of Philosophy (Ph.D.)

The Doctor of Philosophy (Ph.D.) degree is administered through the College of Engineering Interdisciplinary Program; it may have civil engineering as an option. A candidate for the degree of Doctor of Philosophy must comply with the rules and regulations outlined in the general requirements. The research work for the doctoral dissertation must show a high degree of originality on the part of the student and must constitute an original contribution to the art and science of civil engineering.

Civil Engineering (C.E.)

201. *Principles of Boundary Surveying.* 3 hr. PR: C.E. 101 or consent. A study of the retracement requirements for metes and bounds survey systems. The study will include interpretation and writing of the property descriptions, legal principles related to boundary establishment, and analytical approaches to boundary location. 3 hr. rec.
208. *Control Surveying.* 3 hr. PR: C.E. 101. A study of the measurement and computation techniques used to locate positions on the surface of the earth. 2 hr. rec., 3 hr. lab.
212. *Concrete and Aggregates.* 3 hr. PR: C.E. 110 or consent. Considerations and methods for the design of concrete mixes. Properties of portland cement and aggregates and their influence on the design and performance of concrete mixtures. Testing of concrete and aggregate and the significance of these tests. 2 hr. rec., 3 hr. lab.
213. *Construction Methods.* 3 hr. PR: Junior or senior standing in civil engineering. Study of construction methods, equipment, and administration with particular emphasis on the influence of new developments in technology. 3 hr. rec.
220. *Computational Fluid Mechanics.* 3 hr. PR: C.E. 120, E. 2 or consent. Use of the computer in elementary hydraulics, open channel flow, potential flow, and boundary layer flow, numerical techniques for solution of algebraic equations, ordinary differential equations, and partial differential equations. 3 hr. rec.
231. *Highway Engineering.* 3 hr. PR: C.E. 132, 181. Highway administration, economics and finance; planning and design; subgrade soils and drainage; construction and maintenance. Design of a highway. Center-line and grade-line projections, earthwork and cost estimate. 2 hr. rec., 3 hr. lab.
233. *Urban Transportation Planning and Design.* 3 hr. PR: C.E. 132 or consent. Principles of planning and physical design of transportation systems for different parts of the urban area. Land use, social, economic, and environmental compatibilities are emphasized. Evaluation and impact assessment.
235. *Railway Engineering.* 3 hr. PR: C.E. 101. Development and importance of the railroad industry. Location, construction, operation, and maintenance. 3 hr. rec.

240. *Applied Hydrology*. 3 hr. PR: Consent. The hydrologic cycle with emphasis on precipitation and runoff as related to design of hydraulic structures, soil and water conservation, and flood control. 3 hr. rec.

245. *Properties of Air Pollutants*. 3 hr. PR: Consent. Physical, chemical, and biological behavioral properties of dusts, droplets, and gases in the atmosphere. Air pollutant sampling and analysis. Planning and operating air pollution surveys. 2 hr. rec., 3 hr. lab.

251. *Public Health Engineering*. 3 hr. PR: Consent. Engineering aspects involved in control of the environment for protection of health and promotion of comfort of humans. Communicable disease control, milk and food sanitation, air pollution, refuse disposal, industrial hygiene, and radiological health hazards. 3 hr. rec.

252. *Water Resources Engineering*. 3 hr. PR: C.E. 146. Application of hydrologic and hydraulic principles in the design and analysis of water resources systems. Topics include hydraulic structures, economics and water law irrigation, hydroelectric power, navigation, flood-drainage litigation, and water-resources planning. 3 hr. rec.

260. *Structural Analysis 2*. 3 hr. PR: C.E. 160. Fundamental theory of statically indeterminate structures. Analysis of indeterminate beams, frames and trusses by stiffness and flexibility methods; computer-aided structural analysis by standard computer codes; study of influence lines for beams, frames, and trusses. 3 hr. rec.

270. *Reinforced Concrete Design*. 3 hr. PR: C.E. 110, 160; PR or Conc.: C.E. 260. Behavior and design of reinforced concrete members. Material properties; design methods and safety considerations; flexure; shear; bond and anchorage; combined flexure and axial load; footings; introduction to torsion, slender columns, and prestressed concrete. 2 hr. rec., 3 hr. lab.

271. *Steel Design*. 3 hr. PR: C.E. 110, 160; PR or Conc.: C.E. 260. Design of steel bridge and building systems with emphasis on connections, beams, columns, plastic design, and cost estimates. 3 hr. rec.

274. *Timber Design*. 3 hr. PR: C.E. 110, 160; PR or Conc.: C.E. 260. Fundamentals of modern timber design and analysis. Topics include wood properties, design of beams, columns, trusses and pole structures using dimension lumber, glue-laminated products, and plywood. 3 hr. rec.

281. *Foundations Engineering*. 3 hr. PR: C.E. 181. The practice of geotechnical engineering, subsurface explorations, geotechnical analysis and design of shallow and deep foundations, retaining structures, stability of earth slopes, soil and site improvement. 3 hr. rec.

283. *Earthwork Design*. 3 hr. PR: C.E. 181. Use of soil mechanics principles in the analysis, design, and construction of earth structures. Principles of compaction and compaction control; an introduction to slope stability analysis and landslides, earth reinforcement systems, and ground improvement techniques. 3 hr. rec.

290. *Civil Engineering Problems*. 1-6 hr. PR: Junior or senior standing. Special topics in various aspects of civil engineering analysis, design, and construction.

291. *Comprehensive Project for Civil Engineering*. 3 hr. PR: Senior standing in civil engineering. Application of civil engineering principles, through group studies, to develop a solution for a comprehensive engineering problem. Consideration given to a problem involving all aspects of civil engineering. 1 hr. rec., 3 hr. lab.

293. *Basic Finite Element Methods*. 3 hr. PR: Senior standing or consent. Simplified treatment of theoretical basis of finite element method, background theory, formulation and applications: stress analysis in axial columns, one-dimensional heat and fluid flow, consolidation, beam-column analysis, mass transport, and overland flow.

296. *Civil Engineering Studies*. 1-3 hr. (Only 3 hr. credit may be applied toward the B.S.C.E. degree.) PR: Consent. Supervised internships and field experience in civil engineering analysis, design, and construction.

307. *Photogrammetry*. 3 hr. PR: C.E. 101. Camera calibration, stereoscopy, parallax, geometry of vertical and oblique photographs, theory and techniques of orientation, stereoscopic plotting instruments and analytical methods. 2 hr. rec., 3 hr. lab.

311. *Pavement Design*. 3 hr. PR: C.E. 281 or consent. Effects of traffic, soil, environment, and loads on the design and behavior of pavement systems. Design of pavement systems. Consideration of drainage and climate. Pavement performance and performance surveys. 3 hr. rec.

320. *Groundwater Dynamics*. 3 hr. PR: Consent. Introduction to groundwater, formulation of equations for saturated and unsaturated flow, analytical solutions for steady and transient cases, transport of pollutants and numerical techniques. 3 hr. rec.

321. *Environmental Fluid Mechanics*. 3 hr. PR: Consent. Equations of motion including buoyancy and Coriolis force, mechanics of jets and plumes, diffusion, dispersion and mixing in rivers, lakes, reservoirs, and estuaries. 3 hr. rec.

332. *Airport Planning and Design*. 3 hr. PR: C.E. 132 or consent. Financing, air travel demand modeling, aircraft trends, traffic control, site selection, ground access, noise control, geometric design, pavement design, terminal facilities. 3 hr. rec.

333. *Geometric Design of Highways*. 3 hr. PR: Consent. The theory and practice of geometric design of modern highways. Horizontal and vertical alignment, cross-slope, design speed, sight distances, interchanges, and intersections. Critical analysis of design specifications. 2 hr. rec., 3 hr. lab.

334. *Introduction to Traffic Engineering*. 3 hr. PR: C.E. 132 or consent. The purpose, scope, and methods of traffic engineering. Emphasis on the three basic elements of each element and interactions between the elements. Laboratory devoted to conducting simple traffic studies, solving practical problems, and designing traffic facilities. 2 hr. rec., 3 hr. lab.

336. *Highway Planning*. 3 hr. PR: Consent. Theory and practice of highway investment decision-making with emphasis on quantitative techniques of traffic assignment and travel demand forecasting, system evaluation, establishing priorities and programming. Both rural and urban highway systems are considered. 3 hr. rec.

337. *Public Transportation Engineering*. 3 hr. PR: Consent. Design of rail and highway modes for urban and rural areas. Consideration of vehicle technology, facility and route design, conventional and paratransit services, and related marketing, finance and coordination issues. 3 hr. rec.

338. *Highway Safety Engineering*. 3 hr. PR: C.E. 231 or consent. Relationship between human, vehicular, and roadway factors which impact safety; functional requirements of highway safety features; legal aspects; accident analysis; evaluation of highway safety projects. 3 hr. rec.

339. *Traffic Engineering Operations*. 3 hr. PR: C.E. 334. Theory and practice of application of traffic engineering regulations; traffic control concepts for urban street systems and freeways; freeway surveillance and incident management; driver information systems; traffic control system technology and management. 3 hr. rec.

349. *Solid Waste Disposal*. 3 hr. PR: Consent. Patterns and problems of solid waste storage, transport, and disposal. Examinations of various engineering alternatives with appropriate consideration for air and water pollution control and land reclamation. Analytical approaches to recovery and reuse of materials. 2 hr. rec., 3 hr. lab.

350. *Sanitary Chemistry and Biology*. 3 hr. PR: C.E. 147 or consent. Study of physical and chemical properties of water. Theory and methods of chemical analysis of water, sewage, and industrial wastes. Biological aspects of stream pollution problems. 2 hr. rec., 3 hr. lab.

353. *Hazardous Waste Control Engineering*. 3 hr. PR: Consent. Definition of hazards; unit processes for hazardous waste treatment; secure land disposal of hazardous wastes; cleanup of hazardous material spills and abandoned waste dumps; and related topics. 3 hr. rec.

356. *Principles of Biological Waste Treatment*. 3 hr. PR: C.E. 350 or consent. Examination of biological treatment systems related to microbiology and function. Models used to describe system behavior and kinetics are developed. Laboratory and field experiments are performed to understand the relation between operation and design. 2 hr. rec., 3 hr. lab.

361. *Statically Indeterminate Structures*. 3 hr. PR: C.E. 260 or consent. Force and displacement methods of analysis; energy principles and their application to trusses, frames, and grids; effects of axial forces; influence lines for frames, arches, and trusses; secondary stress analysis. 3 hr. rec.

363. *Introduction to Structural Dynamics*. 3 hr. PR: C.E. 361 or 460. General theory for dynamic response of systems having one or several degrees of freedom. Emphasis on the application of dynamic response theory to structural design. 3 hr. rec.

373. *Prestressed Concrete*. 3 hr. PR: C.E. 260, 270 or consent. Behavior and design of prestressed concrete members. Materials, bending, shear, torsion, methods of prestressing, prestress losses, deflections, compression members, composite members, indeterminate structures. 3 hr. rec.

380. *Soil Properties and Behavior*. 3 hr. PR: C.E. 281 or consent. Soil mineralogy and the physico-chemical properties of soils and their application to an understanding of permeability, consolidation, shear strength, and compaction. Prediction of engineering behavior of soils in light of physico-chemical concepts. 3 hr. rec.

381. *Soil Testing*. 3 hr. PR: C.E. 181 or consent. Experimental evaluation of soil properties and behavior. Emphasis is placed on the proper interpretation of experimental results and application of such results to practical problems. 1 hr. rec., 6 hr. lab.

385. *Airphoto Interpretation*. 3 hr. Study of techniques for obtaining qualitative information concerning type and engineering characteristics of surficial materials. Use of airphoto interpretation for evaluation of engineering problems encountered in design and location of engineering facilities. 3 hr. rec.

393. *Advanced Finite Element Methods*. 3 hr. PR: C.E. 293 or consent. Formulation procedures and applications of finite element methods to two- and three-dimensional problems, techniques for nonlinear analysis computer implementation; applications in field problems, flow, and dynamics.

432. *Transportation Systems Analysis*. 3 hr. PR: Consent. Systematic examination of the interaction between transport technology, activity systems, and traffic flows. Quantitative analysis of the relationship among vehicle cycles, networks, congestion, choice behavior, cost functions, and resulting travel-market equilibration. 3 hr. rec.

440. *Deterministic Hydrology*. 3 hr. PR: Consent. An in-depth treatment of the dynamics of the accumulation of runoff, including the formulation of the unsteady surface flow equations and the unsteady saturated-unsaturated subsurface flow equations. Both analytical and numerical solutions are presented with applications. 3 hr. rec.

441. *Stochastic Hydrology*. 3 hr. PR: Consent. The use of probabilistic and random processes techniques in the study of hydrologic problems, including multivariate time series and frequency-domain analyses of hydrologic data, and stochastic modeling of multidimensional hydrologic processes. 3 hr. rec.

450. *Environmental Systems Engineering*. 3 hr. PR: C.E. 252 or consent. Mathematical and computer modelling of environmental systems with emphasis on decision-making; applications will be selected from some or all of the following areas: water quality, water resources planning, solid waste management, waste treatment. 3 hr. rec.

452. *Water Treatment Theory*. 3 hr. PR: C.E. 350. Theory of various procedures and techniques utilized in treatment of water for municipal and industrial use. Review of water quality criteria. Design of water purification facilities. 2 hr. rec., 3 hr. lab.

454. *Industrial and Advanced Waste Treatment*. 3 hr. PR or Conc.: C.E. 350 or consent. Basic physical and chemical unit operations used in industrial and advanced waste treatment; applications for waste water reclamation and reuse; study of industrial wastes from standpoint of process, source, and treatment. 2 hr. rec., 3 hr. lab.

457. *Hydraulics of Sanitary Engineering Works*. 3 hr. PR: C.E. 120. Hydraulics of sanitary sewers, storm sewers, and water distribution systems; design of special structures including pumping stations, siphons and retention basins; analysis of flow sources including sewer infiltration studies, material selection, and construction methods. 3 hr. rec.

458. *Design of Sanitary Works*. 3 hr. PR: C.E. 120. Water supply and waste water disposal problems. Design of treatment facilities. 2 hr. rec., 3 hr. lab.

460. *Finite Element Methods in Structural Analysis*. 3 hr. PR: C.E. 361 or consent. Relationships of elasticity theory; definitions and basic element operations; direct and variational methods of triangular and rectangular elements related to plane stress, plane strain, and flat plates in bending; variational principles in global analysis. 3 hr. rec.

461. *Bridge Engineering*. 3 hr. PR: C.E. 361 or consent. Statically indeterminate trusses, continuous trusses; steel and concrete arches; long-span and suspension bridges; secondary stresses. 3 hr. rec.

462. *Numerical Analysis of Engineering Systems*. 3 hr. PR: C.E. 361 or consent. Numerical methods for the solution of equilibrium, eigenvalue and propagation problems of discrete and continuous structural systems with special emphasis on weighted residual techniques. 3 hr. rec.

470. *Behavior of Steel Members*. 3 hr. PR: C.E. 271 or consent. Elastic behavior of steel members subjected to axial load, bending, and torsion. Elastic and inelastic response of beams, columns, and beam-columns to load and the resulting design implications. Comparison with standard steel codes and specifications. 3 hr. rec.

471. *Light Gage Metal Design*. 3 hr. PR: C.E. 260, 271, or consent. Analysis and design of light gage material systems; flexural and compression members design; investigations into post buckling strength and optimum weight systems. 3 hr. rec.

473. *Structural Design for Dynamic Loads*. 3 hr. PR: C.E. 363 or consent. Nature of dynamic loading caused by earthquakes and nuclear weapons blasts; nature of dynamic resistance of structural elements and structural systems; criteria for design of blast-resistant and earthquake resistant structures; simplified and approximate design methods. 3 hr. rec.

475. *Analysis and Design of Multistory Structures*. 3 hr. (May be repeated once.) PR: C.E. 363, and C.E. 270 or 271. Introduction; service, structural and construction systems; analysis and design for lateral and gravity forces; structural modeling; computer applications; approximate methods; connections; foundations; review of standard building codes; special topics. 3 hr. rec.

476. *Behavior of Reinforced Concrete Members.* 3 hr. PR: C.E. 270 or consent. Studies of actual member behavior; members in flexure, combined flexure, shear, and torsion; bond and anchorage; combined axial load and flexure; slender columns; deep beams; derivation of current code provisions. 3 hr. rec.

477. *Behavior of Reinforced Concrete Structures.* 3 hr. PR: C.E. 476. Continuation of C.E. 476. Limit state design; continuous beams and frames; moment redistribution; flat plates and flat slabs; two-way slabs; yield line theory; comparison of theory with standard practice; results of recent research; special topics. 3 hr. rec.

481. *Advanced Mechanics of Soils.* 3 hr. PR: C.E. 181, 381, M.A.E. 318 or consent. Stress invariants, stress history and stress path, elastic and quasi-elastic models for soils; soil plasticity, failure theories for soils; critical state soil mechanics, and determination of construction parameters. 3 hr. rec.

482. *Advanced Foundation Analysis.* 3 hr. PR: C.E. 281 or consent. Study of soil-structure interaction. Applications of principles of soil mechanics and numerical methods for analysis and design of geotechnical structures: strip footings, axially and laterally loaded piles, braced excavations, sheet pile walls, tunnel lining, and buried pipes and culverts. 3 hr. rec.

483. *Advanced Earthwork Design.* 3 hr. PR: C.E. 283 or consent. Application of the principles of theoretical soil mechanics to the design of embankments of earth and rock. In-depth study of compaction theory, stability of natural and man-made slopes by limit equilibrium and deformation considerations. 3 hr. rec.

484. *Groundwater and Seepage.* 3 hr. PR: Consent. Flow of groundwater through soils and its application to the design of highways and dams and to construction operations. Emphasis is placed on both the analytical and classical flow net techniques for solving seepage problems. 3 hr. rec.

485. *Geotechnical Risk Assessment.* 3 hr. PR: C.E. 281, 283 or consent. Application of probabilistic and statistical principles to geotechnical analysis and design. Random and spatial variability of soil properties; decision under uncertainty; reliability of geotechnical structures. 3 hr. rec.

486. *Soil Dynamics.* 3 hr. PR: C.E. 380 and consent. Consideration of the simple damped oscillator, wave propagation in elastic media, dynamic field and laboratory tests, dynamic soil properties, and foundation vibrations. Introduction to geotechnical aspects of earthquake engineering. 3 hr. rec.

487. *Design of Earth Dams.* 3 hr. PR: C.E. 283 and 484, or consent. Application of the principles of geotechnical engineering to the analysis, design and construction of earth and earth-rock embankment dams. 3 hr. rec.

488. *Geotechnical Case Histories.* 3 hr. PR: C.E. 281 and 283 or consent. Application of principles of geotechnical engineering to professional practice as taught through the case histories approach. Study of actual problems in geotechnical engineering and their solutions. 3 hr. rec.

491. *Advanced Study.* 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

495. *Seminar.* 1-2 hr. PR: Consent. Studies and group discussion of structural, fluid mechanics, surveying, transportation, soil mechanics and foundations, and sanitary problems.

496. *Graduate Seminar.* 1 hr. PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of the student's program.

497. Research. 1-15 hr.

498. Thesis. 2-4 hr. PR: Consent.

499. Graduate Colloquium. 1-6 hr. PR: Consent. For graduate students not seeking course-work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

COMMUNICATION STUDIES

James C. McCroskey, Chairperson of the Department

130 Armstrong Hall

Degree Offered: Master of Arts

Graduate Faculty: Members M. Booth-Butterfield, Gorham, Klopf, McCroskey, Richmond, Wheless, and Zakahi. Associate members: S. Booth-Butterfield and Roach.

Master of Arts (M.A.)

The Department of Communication Studies offers work leading to the degree of master of arts (M.A.), with a concentration in communication theory and research. Persons who possess a bachelor's degree from an accredited college or university may be admitted to the program. Qualified graduate students from a variety of disciplines are admitted to the program. The master of arts degree program is intended to qualify the student to:

1. Assume a variety of professional roles in educational, industrial, governmental, or media institutions.
2. Teach the subject matter in high school and/or college.
3. Undertake advanced training toward a doctorate in the behavioral sciences.

In addition to the general WVU requirements, the graduate student in communication studies must meet departmental requirements. These include successful completion of the minimum number of required graduate hours as set forth in program A, B, or C, below with a grade of B or above in each class and the maintenance of a minimum grade-point average of 3.0.

Applicants for admission must specify the program they wish to pursue. program A is open only to full-time resident students. Programs B and C are open to both part-time and full-time students.

Program A—Thesis Program

All students planning to continue graduate study past the M.A. level are encouraged to enter this program. The following are required:

1. At least 36 hours of graduate credit, 30 of which must be in the Department of Communication Studies. A maximum of 6 hours of thesis credit will be allowed.
2. Completion of Comm. 401 and 420.
3. A thesis.
4. An oral examination on the thesis.

Program B—Non-Thesis Program

All students planning a professional career in a field other than education are encouraged to enter this program. This is normally a terminal degree program in communication studies. The following are required:

1. A minimum of 36 hours of course work with at least 30 hours in the Department of Communication Studies.
2. Completion of Comm. 401 and 420.

3. Successful completion of written and oral comprehensive examinations. The oral examination may be waived with the approval of the student's examination committee and the departmental coordinator of graduate studies.

Program C—Non-Thesis Program

All students planning a professional career in elementary or secondary education are encouraged to enter this program. This is normally a terminal degree program in communication studies. Students may complete this program through off-campus study, on-campus study, or a combination. The following are required:

1. A minimum of 33 hours of course work with at least 24 hours in the Department of Communication Studies including Comm. 361, 362, 363, and 491.

2. Successful completion of written and oral comprehensive examinations. The oral examination may be waived with the approval of the student's examination committee and the departmental Coordinator of Graduate Studies.

Communication Studies (Comm.)

201. *Principles of Communication Education.* I. 3 hr. PR: 15 hr. communication studies. Literature, principles, and current practices of communication education in public schools with directed application. Intended for teachers in communication and language arts.
206. *Advanced Study in Nonverbal Communication.* I, II. 3 hr. PR: Spch. 106. Functions of nonverbal communication including status, power, immediacy, relationship development, regulation, turn-taking, leakage and deception, intuition, person perception, and emotional expressions.
221. *Persuasion.* I, II. 3 hr. PR: Spch. 11. Theory and research in persuasion, emphasizing a critical understanding and working knowledge of the effects of social communication on attitudes, beliefs, and behavior.
230. *Survey of Rhetorical-Communication Theory.* I, II. 3 hr. PR: Spch. 11. A survey of theory in the rhetorical communication context with emphasis upon periods preceding the twentieth century.
231. *Communication and Symbol Analysis.* I, II. 3 hr. PR: Spch. 131. Advanced study of language in communication. Specific attention to conversational analysis.
361. *Communication in the Classroom.* I, II, S. 3 hr. PR: Teaching experience or consent. Role of interpersonal communication in classroom environment, with particular emphasis on communication between students and teachers. Recommended for elementary, secondary, and college teachers in all fields.
362. *Nonverbal Communication in the Classroom.* I, II, S. 3 hr. PR: Spch. 361. Impact of nonverbal communication behaviors of students and teachers on teacher-student interaction and student learning. Recommended for elementary, secondary, and college teachers in all fields.
363. *Communication in the Educational Organization.* I, II, S. 3 hr. PR: Spch. 361. Problems of communication within educational organizations with emphasis on elements that impact educational change, conflict management, and interpersonal influence. Recommended for elementary, secondary, and college teachers in all fields.

364. *Communication Problems of Children*. I, II, S. 3 hr. PR: Spch. 11. (Primarily for elementary and secondary school teachers and language arts supervisors.) Normal maturational development of listening and speaking skills, their relationships to language acquisition, and influence upon achievement.

365. *Media in Communication and Education*. I, II, S. 3 hr. Use of the media in educational and other communication environments with emphasis on communication processes and principles relevant to television and film.

370. *Interpersonal Communication: Theory and Research*. I, II, S. 3 hr. PR: Consent. Survey of the theory and research in dyadic interpersonal communication. Attention to accuracy, coordination, and congruency models with emphasis upon relational communication and intimate communication in interpersonal relationships.

371. *Theory and Research in Language*. II. 3 hr. Syntactics, semantics, and pragmatics of language behavior. Analyses of contemporary linguistic theories.

372. *Theory and Research in Mass Communication*. I, II. 3 hr. Mass communication from a consumer's viewpoint. Use of consumer-oriented mass media research also stressed.

373. *Theory and Research in Persuasion*. I, II, S. 3 hr. Various theories and principles of persuasion with emphasis on contemporary research literature.

374. *Intercultural Communication: Theory and Research*. 3 hr. Advanced seminar in communication of various cultures. Special emphasis on research in diffusion of innovations.

375. *Communication Apprehension and Avoidance*. 3 hr. PR: Graduate standing. Theory and research related to individuals' predispositional and situational tendencies to approach or avoid communication. Emphasis on work in the areas of willingness to communicate, communication apprehension, reticence, and shyness.

376. *Theory and Research in Organizational Communication*. I, II. 3 hr. Contemporary research linking communication variables and networks to organizational change, effectiveness, leadership, power, and management practices. Analysis of communication problems within a variety of organizations.

377. *Small Group Theory and Practice*. I, II, S. 3 hr. Specific research areas in interpersonal communication with intensive emphasis on small groups.

401. *Introduction to Graduate Study in Human Communication*. I. 3 hr. Major emphasis on designing and conducting experimental and laboratory research in human communication. Computer applications to social science research also given consideration. Should be taken the first semester of graduate study.

402. *Advanced Seminar in Research Methods*. II. 3 hr. PR: Spch. 401. Research techniques necessary to conduct original communication research. Emphasis on advanced statistical techniques.

420. *Survey of Human Communication Theory*. I. 3 hr. Broad overview of contemporary theories in human communication. Should be taken the first semester of graduate study.

433. *Special Topics*. I, II, S. 3-12 hr. PR: Consent. Thorough study of special topics in human communication including interpersonal and small group, language, intercultural, organizational, persuasion, and mass communication, nonverbal communication, and communication education.

475. *Independent Study*. I, II, S. 1-3 hr. PR: Consent. Open to graduate students pursuing independent study in communication.

- 490. *Teaching Practicum. I, II. 3 hr. PR: Consent. (Open only to graduate assistants in the Department of Speech Communication.) Supervised experience in classroom teaching.*
- 491. *Advanced Study. I, II, S. 3 hr. Advanced study in a variety of areas in human communication.*
- 496. *Seminar in Human Communication. I, II, S. 3-9 hr. Current problems and research in human communication.*
- 497. *Research. I, II, S. 1-15 hr.*
- 499. *Thesis. I, II, S. 3-6 hr.*

COMMUNITY HEALTH EDUCATION

J. William Douglas, Dean, School of Physical Education

Carl P. Bahnenan, Chairperson, Department of Health, Physical Fitness, and Athletic Training.

256 Coliseum

Degrees Offered: Master of Science

Graduate Faculty: Associate Members J. Cavendish and K. Douglas.

The Master of Science in Community Health Education and the Master of Arts Degree in Secondary Education through the Department of Education with an emphasis in school health are available. These programs involve a core of courses in health education combined with other courses designed to satisfy individual needs and professional objectives. All applicants must comply with the WVU requirements for graduate study and the requirements of the Department of Community Health Education.

Community Health Education (M.S.)

To be admitted to the M.S. program in community health education, an applicant must have sufficient background in the area of specialization to qualify for admission to graduate courses in community health education. Students with inadequate backgrounds may be required to take additional course work which may not apply to the program.

Health Education (Hl. Ed.)

- 220. *Drug and Alcohol Abuse Prevention. 3 hr. Experiences designed to prevent the development of abusive drug-taking relationships by focusing on psychological variables such as self-esteem, coping skills, and development of support networks.*
- 290. *Women and Health. 3 hr. Examination of theories, myths, and practices surrounding women's physical and mental health from both historical and present-day perspectives. Exploration of specific health issues and controversies and the rise of the women's health movement.*
- 301. *Advanced School Health. 3 hr. PR: Graduate standing and consent. Analysis of problems in school health services, healthful school living, nature of health education, and scope of health instruction which confronts teachers and administrators.*
- 305. *Philosophy of Health Education. 3 hr. PR: Graduate standing and consent. Analysis of the scientific bases, purposes, procedures, and content, with implications for school and public health education.*
- 306. *Community Health. 3 hr. PR: Graduate standing and consent. Health problems requiring community action, basic public health activities, community organizations for health protection, voluntary health agencies, school health programs, and the role of state and federal agencies in the community health program.*

307. *Community Health: Human Sexuality.* 3 hr. PR: Consent. Analysis of sex-related issues including parenting, sex education, sexual sanctions, pornography, sexual dysfunction, and sexual variance. Designed for teachers, health professionals, and interested laypeople.

308. *Community Health: Death Education.* 3 hr. PR: Consent. Surveys death/dying from humanistic viewpoint. Examines philosophical, psychological, legal, and sociological aspects of death, grief, and mourning. Appropriate for teachers, health professionals, and others desiring understanding of death as a part of living.

309. *Community Health: Drug Education.* 3 hr. PR: Consent. Designed to help students learn appropriate components of a drug education program, gain an understanding of drug taking in this society, and acquire insights into dependent behaviors.

320. *Roles and Functions of Health Educators.* 3 hr. PR: Graduate standing and consent. An investigation of the roles and functions of the health educator in a variety of community settings including hospitals, clinics, voluntary agencies, etc.

330. *Health Education and Behavioral Science.* 3 hr. PR: Consent. Integrates the concepts of health education and behavioral science to facilitate changes in health behavior of individuals and groups.

373. *Professional Development.* 1-6 hr. (May be repeated for credit.) PR: Departmental consent. Specially designed experiences for those interested in advancing professional skills in a particular specialty. (Not for degree credit in programs in the College of Human Resources and Education.)

376. *Evaluation of Health Education Research.* 3 hr. PR: Ed. P. 311 or consent. Study of published research to determine basic scientific accuracy and value.

385. *Practicum (Field).* 1-15 hr. PR: Graduate standing and consent. Under the guidance of faculty and counselors, students may assume major responsibility during a semester in a community-wide program. (Required of all students in the M.S. program.)

391. *Advanced Topics.* 1-6 hr.

397. *Master's Degree Thesis.* 1-15 hr.

401. *Health Care Organization and Management.* 3 hr. PR: Consent. To provide future managers, present practitioners, and interested students with organizational and managerial concepts and theories to help analyze and resolve administrative problems in planning and delivering health services in the community.

402. *Designing Public Health Education Programs.* 3 hr. PR: Hl. Ed. 306 and/or Hl. Ed. and consent. Theory and practice of developing health education programs for community health agencies. Students will work in task groups as consultants to local agencies and design comprehensive programs consistent with theory.

482. *Supervised Applied Health Education Project.* 1 hr. PR: Advanced graduate standing or consent. Doctoral students only. Plan and conduct a health education intervention in other than a classroom setting, i.e., a defined community.

483. *Supervised Health Education Research Report.* 1 hr. PR: Advanced graduate standing and consent. Doctoral students only. A written report of empirical research of either a survey or an experiment.

490. *Teaching Practicum.* 1-3 hr. PR: Graduate standing and consent. Supervised practices in college teaching of health-related learning experiences.

491. *Advanced Study.* 1-6 hr. PR: Graduate standing and consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

496. Graduate Seminar. 1 hr. PR: Graduate standing and consent. Graduate students will present at least one seminar to the assembled faculty and graduate student body of this program.
497. Research. 1-15 hr. PR: Graduate standing and consent.
498. Thesis. 2-4 hr. PR: Graduate standing and consent.
499. Graduate Colloquium. 2-4 hr. PR: Graduate standing and consent.

COMPUTER SCIENCE

Donald F. Butcher, *Chairperson of Department of Statistics and Computer Science*
Stanley Wearn, *Director of Computer Science Graduate Programs*
319 Knapp Hall

Degrees Available: Master of Science, Doctor of Philosophy

Areas of emphasis: Computer science and Computer and information sciences

Graduate Faculty: Members Atkins, Butcher, Dodrill, Dowdy, Gunel, Harner, Henry, Hiergeist, Hobbs, Lane, Mooney, Muth, S. Reddy, Y.V. Reddy, Thayne, Townsend, Trapp, Van Scy, and Wearn. Associate Members Chilko, Cleetus, Eichmann, Morley, Nassif, O'Brien, Oren, and Petersen.

Master of Science

The masters degree is intended to qualify the student to assume a professional role in an educational, industrial, or governmental research project, teach in a junior or senior college, or undertake advanced training toward a doctorate in computer science. Because many students receive baccalaureate degrees from colleges which do not offer undergraduate programs in computer science, a student with an outstanding undergraduate record does not need a degree in computer science to enter the master's program.

Applications from students not eligible for admission as regular graduate students and from foreign students are normally evaluated during January for admission to the summer session. Scores of the Graduate Record Examination are required for admission into the master's program.

Students are expected to know the material contained in the following courses upon admission to the program. Otherwise, the deficiencies must be removed as early as possible in the student's degree program.

1. One year of calculus (Math. 15, 16, or equiv.).
2. Thorough knowledge of a structured, higher level programming language such as Ada, C, Modula-2, PL/1 or Pascal (C.S. 1, 2, or equiv.).
3. Assembler language and computer organization (C.S. 50).
4. Data structures and file processing methods (C.S. 51).
5. Discrete mathematics (C.S. 120).
6. Probability and statistics (Stat. 201 or equiv.).

Two options are available for students seeking a master of science. The problem report option requires 36 hours of course work including three hours of credit for a problem report. The thesis option requires 30 hours of course work including six hours of credit for a thesis. Students with a B.S. in Computer Science or equivalent should pursue this option.

Minimum required courses for either option are:

- (a) Three courses from C.S. 320 (or 325 in lieu of 320), 330, 340, 350, 360, 370, 380.
 - (b) Two additional 300-level computer science courses.
 - (c) Three additional 200- or 300-level courses in statistics, computer science, mathematics, industrial engineering, or electrical and computer engineering approved by the student's graduate committee.

All students must pass a final oral examination based upon the problem report/thesis and course work.

No more than one course in which a grade of C is received may be counted toward meeting degree requirements.

Doctor of Philosophy

The Ph.D. is a research degree rather than a course work degree. Doctoral students are required to complete a number of advanced courses but more time is spent in original research in close association with an experienced researcher. The Ph.D. degree is intended to prepare a student for teaching and research in computer and information science for business, industry, and educational institutions.

Applicants are expected to have a master of science equivalent to that offered by the Department of Statistics and Computer Science at West Virginia University, including the requirement for a formal thesis or research report. Applicants must have achieved a minimum 3.0 GPA on a 4.0 scale in studies for the M.S. Minimum requirement for GRE scores are 500 verbal, 600 quantitative, and 550 analytical, with acceptable performance on the subject matter on the advanced GRE.

Applicants satisfying all of the above criteria are considered for admission as regular graduate students by the departmental graduate admissions committee, who make final admission decisions. Superior applicants whose credentials do not warrant regular admission directly into the Ph.D. program may be admitted to the M.S. program or they may be admitted provisionally, with a time limit of three semesters in which to correct all deficiencies in preparation.

Application deadlines:

Fall semester March 1

Spring semester October 1

Summer session January 1

Applications are accepted at any time; however, no guarantee of admission can be made for a specific semester if the deadline has not been met. If applicants cannot enroll at the designated semester after a favorable admission decision, no guarantee is given that they will be permitted to enroll at a later time.

Course Work. The Ph.D. requires a minimum of 18 hours of course work beyond the master's. Therefore, entering doctoral students will be full-time students for their first academic year. Additional course work may be required, but it may be taken on a part-time basis.

Language Skills. All doctoral students must demonstrate reading competency in scientific literature written in a language other than a student's native tongue. The choice of language must be approved by the student's doctoral committee.

Qualifying Examinations. When all course work and language requirements have been met, a doctoral student is permitted to stand for the qualifying examinations, which are prepared, administered, and evaluated by the student's dissertation committee. The examinations are taken within a period of two weeks.

Prospectus. After the qualifying examinations are completed, the doctoral student prepares a prospectus, (a statement of his/her chosen research problem, a review of pertinent scientific literature, and a description of proposed research methods) and presents the prospectus to the dissertation committee. After the committee has questioned the student about the

prospectus and approved it as a topic for doctoral research, the student receives candidacy status.

Residence. Doctoral candidates are expected to spend a minimum of one year in residence for research in addition to the first year in residence for course work.

Dissertation. The final degree requirement is the preparation of a dissertation, presenting the completed research to the dissertation committee, and a public, formal defense of the dissertation. If the dissertation committee believes that the research outlined in the prospectus has been successfully completed and defended, the degree is awarded.

More information concerning graduate studies may be found in "Graduate Programs in Computer Science" available from the department.

(For statistics courses of instruction, see "Statistics.")

Computer Science (C.S.)

- 220. *Numerical Analysis* 1. I, II. 3 hr. PR: Math. 17 or C.S. 120 and a programming language. Computer arithmetic, roots of equations, interpolation, Gaussian Elimination, numerical integration and differentiation. Numerical solution of initial value problems for ordinary differential equations. Least square approximations. (Equiv. to Math. 220.)
- 221. *Numerical Analysis* 2. I, II. 3 hr. PR: C.S. 220 and Math. 241 or consent. Solutions of linear systems by direct and iterative methods. Calculation of eigenvalues, eigenvectors, and inverses of matrices. Applications to ordinary and partial differential equations. (Equiv. to Math. 221.)
- 228. *Discrete Mathematics* 2. II. 3 hr. PR: C.S. 120 and Math. 16 or equiv. Applications of discrete mathematics to computer science. Methods of solving homogeneous and non-homogeneous recurrence relations using generating functions and characteristic equations; digraphs to analyze computer algorithms; graph theory and its ramifications to computer algorithms. (Equiv. to Math. 228.)
- 230. *Programming Languages*. I, II. 3 hr. PR: C.S. 51. Formal definition of programming languages including specification of syntax and semantics. Structure of simple statements and algorithmic languages. List processing and string manipulation languages.
- 235. *Principles of Programming Languages*. I. 3 hr. PR: C.S. 51 or consent. Survey of several programming languages: historical, current, special-purpose, and experimental. Emphasis on comparison of languages features, implementation techniques, and selection of appropriate language for given application.
- 240. *Systems Programming*. I, II. 4 hr. PR: C.S. 51. Software organization for the support of computer components. Addressing techniques, process and data modules, file system organization and management. Traffic control and communication with peripheral devices.
- 241. *Systems Programming*. II. 3 hr. PR: C.S. 240. Memory management; name management; file systems; segmentation; protection; resource allocation; pragmatic aspects in the design and analysis of operating systems.
- 245. *Microcomputer Programming and Interfacing*. II. 3 hr. PR: C.S. 51. Detailed study of a typical microcomputer system including its architecture, operating system, assembly language programming, data communication, computer networking and microcomputer applications (3 hr. lec., 1 2-hr. lab.).
- 260. *Information Analysis*. I, II. 3 hr. PR: C.S. 51. Information analysis and logical design of a computer system. Exercises and case studies are used to give students proficiency in information analysis techniques. Projects are assigned to provide practical experience in systems development and implementation.

270. *System Design*. I. 3 hr. PR: C.S. 51. Underlying principles of system design and techniques. A theme to be carried throughout the course is the iterative nature of the analysis and design process. Implementation and conversion problems also are considered. Practical projects are assigned to give students experience in actual situations.

275. *Software Engineering*. I, II. 3 hr. PR: Two 200-level computer science courses or equivalent. The study of software life cycle, programming methodologies, and project management, with emphasis on an engineering approach to the software development process. Relies on a project-based approach for applying software engineering principles.

280. *Introduction to Computer Graphics*. I. 3 hr. PR: C.S. 51, 120. Overview of computer graphics systems. Topics include software, algorithms for graphics primitives, two-dimensional viewing and transformations, segmentation, methods of input, and three-dimensional concepts.

281. *Introduction to Artificial Intelligence*. I. 3 hr. PR: C.S. 51 or consent. Introductory treatment of foundations of AI and the symbol manipulation language LISP. Survey of the field of AI, production systems, search strategies, game playing, knowledge engineering, weak methods. Applications of AI will be briefly studied.

285. *Computer Organization and Architecture*. I. 3 hr. PR: C.S. 50 and 51. Architecture of current computers and their effects on software design. Von Neumann machines; gates and registers; instruction and address decoding; memory systems; input-output systems; micros, supercomputers, specialized systems.

291. *Topics in Computer Science*. I, II, S. 3 hr. PR: C.S. 51 or equiv. Advanced study of topics in computer science.

301. *Computers in Research*. I. 3 hr. (Statistics and Computer Science majors should obtain their graduate committee approval before registering.) Use of computers in research. Algorithms and programming. Scientific and statistical programming packages.

303. *Microcomputers in Mathematics/Science*. S. 3 hr. PR: Math. 3 or consent. An integrated course in computer science, statistics and mathematics for secondary educators. Focuses on programming techniques and uses problems from the areas of statistics and mathematics at the high school level as examples.

311. *Scientific Computing Applications*. II. 3 hr. PR: C.S. 51. Application of mathematical modelling and simulation methodology, languages, and systems. Discrete simulation using GPSS-V language. Linear programming. Finite difference methods using higher-level languages.

320. *Solution of Nonlinear Systems*. II. 3 hr. PR: C.S. 220 or Math. 241 or consent. Solution of nonlinear systems of equations. Newton and Secant Methods. Unconstrained optimization. Nonlinear overrelaxation techniques. Nonlinear least squares problems. (Equiv. to Math. 320.)

325. *Numerical Interpolation and Approximation*. I. 3 hr. PR: C.S. 220 or consent. Interpolation and approximation using Chebychev polynomials, Pade approximations, Chebychev economization of Taylor Series. Hermite interpolation, orthogonal polynomials and Gaussian Quadrature.

330. *Design of Language Processors*. II. 3 hr. PR: C.S. 230. Study of the design and construction of automatic programming language processors. Investigation of the structure of scientific and business oriented compilers, list processors, and information processing languages.

340. *Theory of Operating Systems*. I. 3 hr. PR: C.S. 240. Theoretical aspects of multiprogrammed and virtual operating systems. Topics include: concurrent processes, processor management, storage management, scheduling algorithms, and resource protection.

350. *Software Engineering in Data Communications.* I. 3 hr. PR: C.S. 240 or consent. Data communication principles, software design techniques or implementing data communications systems, testing and debugging techniques, networks and data link control, software design in a network environment. A "hands-on" project in data communications design is included.

360. *Design of Database Systems.* I. 3 hr. PR: C.S. 260 or consent. Design, evaluation, implementation, and user interface of database systems. Topics include: storage structures, data languages, security, and relational, hierachial and network implementation approaches.

365. *Distributed Database Management Systems.* II. 3 hr. PR: C.S. 260. Reference architectures for distributed database management systems. Integration of local databases stored at different sites into a global database. Heterogeneity of data models. Query translation and optimization. Synchronization of concurrent access. Integrity and reliability.

380. *Interactive Computer Graphics.* II. 3 hr. PR: C.S. 230 or 240 or 260 or consent. Data structures and list handling; picture structures and transformations; rendering of surfaces and solids; interaction handling; display processors and programming systems; and graphics system organization.

390. *Teaching Practicum.* I and II. 1-3 hr. PR: Consent. Supervised practices in college teaching of computer science.

391. *Advanced Topics in Computer Science.* I, II, S. 3-6 hr. PR: Consent. Investigation in advanced computer science subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

396. *Graduate Seminar.* I, II. 1 hr. PR: Consent.

397. *Research in Computer Science.* I, II, S. 1-15 hr. PR: Consent.

490. *Teaching Practicum.* I, II. 1-3 hr. PR: Consent. Supervised practice in college teaching of computer and information sciences.

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

496. *Graduate Seminar.* I, II. 1 hr. PR: Consent.

497. *Research.* I, II, S. 1-15 hr. PR: Consent.

COUNSELING

Jeffrey K. Messing, Division Director, Department Chairperson
502 Allen Hall

Degree Offered: Master of Arts, Area of Emphasis for Doctor of Education
Graduate Faculty: Members L. S. Cormier, W. H. Cormier, Jacobs, Majumder, Marinelli, Masson, Moriarty, Srebalus, Tunick, and Yura. Associate Members DeLo, Greever, and Messing.

Master of Arts in Counseling

The Department of Counseling Psychology and Rehabilitation of the College of Human Resources and Education offers a master's program in counseling. Variations in the curricula allow emphasis in school counseling, community agency/mental health counseling, human resource development counseling for business, industrial, or health settings, and student personnel work in higher education. All candidates for the master of arts in counseling enroll for a common departmental core during the first semester of study.

Selection of an area for concentration is made at the beginning of the second semester; this area governs the choice of courses for the balance of the graduate program. All applicants must comply with University requirements, the College of Human Resources and Education requirements, and departmental requirements.

Students are encouraged to pursue their studies on a full-time basis; however, part-time students are accepted.

NOTE: The counseling curriculum is being revised during the 1989-90 year. The changes will go into effect for the fall 1990 term. Please check with the department for new degree requirements and course descriptions.

Required Counseling Courses

All students who are candidates for a master's in counseling are required to take the following core courses:

- Coun. 301—Counseling Techniques
- Coun. 302—Human Relationships
- Coun. 303—Introduction to the Counseling Profession
- Coun. 305—Theory and Practice of Human Appraisal
- Ed. Pysch.320—Introduction to Educational Research
- Coun. 306—Counseling Theories
- Coun. 308—Organization of School Guidance Services*
- Coun. 320—Vocational Development and Occupational Choices
- Coun. 330/382—Counseling Children/Counseling Adults
- Coun. 331—Consultation Theory and Techniques
- Coun. 385—Practicum
- Coun. 386—Internship
- Electives (2)

*Course required for school counselor certification only. A special school counselor certificate is available for individuals without a teaching background. The program includes an additional nine hours of course work.

Please note: Doctoral level courses in counseling have the prefix "C. Psy.".

Admission Requirements

Applications for admission to the counseling program should be made to West Virginia University, Office of Admissions and Records. In addition to the admission requirements of the University and the College of Human Resources and Education, the Department of Counseling Psychology and Rehabilitation has the following admission requirements:

- A baccalaureate degree with course work in appropriate areas;
- A minimum undergraduate grade-point average of 2.8, based on a 4.0 system;
- Three letters of reference;
- Completion of the application to the counseling program.

The initial screening decision is based upon this information. Successful applicants are then interviewed by program faculty. Final decisions about admission are based on both the requirements and the interview process. Of the two steps in the process, the grade-point average and interpersonal skills demonstrated during the interview have the greatest input into the decision process.

Counseling provides a broad opportunity to work with children at the elementary-school level, adolescents at the secondary-school level, young adults at the college level, and adults in business and industry and in community agencies. The school counselor is involved in personal counseling,

career guidance, vocational and educational counseling, family counseling, and consultation on classroom problems with teachers and administrators. Counselors must be equipped to work with both individuals and groups. Much of the school counselor's work is carried out in classrooms with teachers and students. The school counselor also is active in working with community agencies. At the college level, the counselor may work extensively with the special educational services available for the benefit of the college student. Degree requirements include completion of the core curriculum, and additional required courses, required counseling course work, and six semester hours of pre-practicum under faculty direction. A minimum of 48 hours of course work with a 3.0 grade-point average is required.

In addition to completing all course work and the pre-practicum and internship satisfactorily, the candidate must demonstrate the ability to assume the responsibility required of a professional counselor and the personal characteristics and ethical standards essential to effective working relationships with others.

These personal characteristics are assessed during the clinical course work components of the program and during the pre-practicum and field experience. Students who do not meet professional and clinical standards in these areas are provided feedback, and resources for remediation are recommended. In these cases, successful remediation is required as a prerequisite for successful program completion, with an additional nine hours of internship. Students who violate AACD ethical standards are dismissed from the program.

Please contact the program for a listing of the additional required courses in this area.

Areas of Specialization

Community Counseling: In reviewing the curriculum available in counseling, the applicant will note that much of the course work provides the background applicable for employment in general community agency work. Some graduates who do not take employment directly in rehabilitation or school settings find a limited number of opportunities as general counselors in the fields of public welfare, mental health, drug and alcohol counseling, employment security, and corrections.

Human Resource Development Counseling: A limited number of opportunities exist to emphasize counseling and employee development training for application in business, industry, and health settings. This program prepares personnel to deal with employee assistance needs (i.e., substance abuse), organizational development and human relations training, employee career development, performance assessment, and productivity enhancement. An undergraduate program in business, management, or nursing is helpful but not required. Admission preference is given to persons currently employed in business and industry.

Please contact the program for a listing of additional required courses in this area.

All students enrolled in the master of arts in counseling program are expected to attend a minimum of eight different continuing education/professional development training seminars. These seminars or workshops must be related to counseling. The counseling program will provide many of these activities. The student should check with the assigned adviser for a list of seminar options.

Counseling programs are available for both full-time and part-time students. An active summer program is available for part-time students. Degree requirements may be completed in four consecutive summers. Since there is a limited number of summer sites, there can be no guarantee of summer practicum placement.

Certification Requirements For School Counselors in West Virginia

Certification requirements in school counseling are the same as for the Masters of Arts in counseling, except as noted below:

1. A minimum grade-point average of 3.0.
2. Recommendation of the faculty.
3. A valid professional teaching certificate at the level for which counseling and guidance endorsement is desired, or the completion of a nine-hour block of professional education course work and competency assessment in addition to the 48-hour master's degree program.
4. Completion of the required pattern of certification courses. (Contact the department for this list.)
5. Specialization area examination. Satisfactory performance is required for certification eligibility.

Counseling Option for C.A.S.

Additional Admission Requirements

All applicants must comply with the WVU requirements, requirements of the College of Human Resources and Education, and the Counseling Psychology and Rehabilitation Department.

1. Completion of a master's degree in counseling or equivalent, comparable to the WVU master's degree in counseling with approved practicum experience.
2. Minimum graduate grade-point average of 3.0.
3. A total score of 1,000 on the Graduate Record Examination aptitude test.
4. Personal interview with faculty members in counseling psychology.
5. Demonstration of competency in counseling, measurement, statistics, and the guidance function in education as evidenced by letters of reference and appropriate examinations.
6. Evidence of successful appropriate work experience.
7. Written justification for choice in area of specialization.
8. Three references for recommendation.
9. Plan of study approved by adviser.

Areas of Specialization

Elementary-School Counseling
Student Personnel Work
Employment Counseling
Pupil Personnel Services
Secondary-School Counseling

Requirements for Graduation

1. Completion of 36 semester hours of approved graduate work.
2. A minimum grade-point of 3.2 on all course work attempted under the Certificate of Advanced Study program.
3. Demonstration of competencies as a specialist in the chosen area of specialization.
4. Recommendation of the department.

Program

Counseling core requirements will change in 1990-91 consistent with overall curriculum modifications. Please check with the department chair.

1. Twelve semester hours core from Counseling:

Coun. 331—Consultation Theory and Techniques, 3 hr.

Coun. 385—Practicum, 3 hr.

Psych. 401—Advanced Counseling Techniques, 3 hr.

Psych. 469—Theory and Practice of Student Appraisal, 3 hr.

2. Twelve semester hours elected with adviser's consent in specialty area of advanced courses either internal or external to the counseling program.

3. Six hours to achieve competence in consumption and production of field research.

4. Six hours research problem in area of specialization.

Residency (Minimum)

1. One semester or two summers (12 hr.) on campus.

2. Program completion of 12 hr. off-campus and transfer, or approved interuniversity cooperative program.

Counseling Psychology Option for Ed.D.

All applicants must comply with the graduate requirements of the College of Human Resources and Education and the program of counseling psychology. The program includes course work hours in addition to the College of Human Resources and Education requirements for the Ed.D. degree.

The area of specialization for the doctoral degree is oriented primarily toward training practitioners who have a substantial background in the philosophy and methods of psychology as a comprehensive science. Students are expected to work closely with faculty in doing research and in supervised therapy practice. Successful completion of the program requires core coursework in counseling psychology, as well as in clinical psychology, statistics and research, and supervised practice.

Additional Entrance Requirements

The admission process is a two-stage procedure. Each spring, applications received by January 15th are reviewed for admission to the next academic year.

Stage I

Applicants are screened based on written information and credentials provided to the admissions committee, including the following:

1. Completion of a master's degree in an area related to counseling psychology.

2. Graduate grade-point average of 3.5, verified by official transcripts of graduate course work.

3. Three letters of recommendation to support applicant's competency in counseling, testing, research, and personal qualities of readiness for completion of a doctoral degree.

4. A minimum total score of 1,000 on the Graduate Record Examination. At least two years of relevant work experience is desirable.

Stage II

Those persons who are successful in stage I are invited to campus for a personal interview with the program faculty. The personal interview is

required for a final admission decision. The interview helps to determine the applicant's interpersonal and clinical skills, which are predictive of success in graduate study, internship, and post-degree placement.

Announcements regarding admission are made on or before May 15. Materials received after January 15th are not reviewed until the following year, unless space is available. Students are accepted for study toward the Ed.D. degree upon admission into the department. Requirements for doctoral candidacy are the following:

1. Completion of prerequisite doctoral coursework with a 3.0 grade-point average;
2. A written comprehensive examination of major areas in counseling psychology and research;
3. Completion of an approved research prospectus.

After admission to candidacy, students are eligible to enroll in internship. The internship is a full-time academic or calendar year in an off-campus training site approved by the internship committee. After successful completion of the internship and the research dissertation, students take a final oral examination regarding their dissertation research.

Counseling (Coun.)

216. *Behavior Problems and the School.* II. 3 hr. A course primarily oriented toward assisting educators utilize current psychological principles related to classroom discipline, as well as academic and social adjustment.

283. *Workshop in Counseling and Guidance.* I, II, S. 1-12 hr. PR: Consent. To take care of credits for special workshops and short intensive limit courses on methods, supervision, and other special topics.

301. *Counseling Techniques.* I, II, S. 3 hr. PR: Consent. Development and application of basic counseling skills including interviewing, clinical observation, and a general orientation to counseling settings. Evaluation will be based on strengths and deficits in intra and interpersonal skills and on demonstration of counseling skills in checkout situations. In-setting laboratory experience required.

302. *Human Relationships.* I, II, S. 1-3 hr. PR: Consent. Experientially based learning model which focuses on group processes and procedures. Provides self-screening opportunities for prospective counselors. Evaluation is based on personal characteristics essential to effective working relations with others.

303. *Introduction to the Counseling Profession.* I, II, S. 3 hr. An overview of the counseling profession, treating current practices and issues.

305. *Theory and Practice of Human Appraisal.* I, II, S. 3 hr. An overview of standardized evaluation methods commonly utilized in educational and rehabilitation settings. Experience is provided in selection, administration, and interpretation of selected instruments.

306. *Counseling Theories.* II, S. 3 hr. PR: Coun. 301, 302, 303 and consent. A study of counseling approaches commonly used in public schools, colleges, and rehabilitation agencies. Application of theory emphasized.

308. *Organization/Development: School Guidance Services.* I, S. 3 hr. PR: Coun. 303, 305, 306, 320, and consent. Design and conduct of a school needs assessment, development of an annual guidance program, and review of current professional legal issues.

309. *Group Counseling Theory and Techniques.* II, S. 3 hr. PR: Coun. 306 and consent. Theories of group counseling and demonstrations of specific group techniques. Evaluation will be based on expertise in group facilitation.

- 310. *Introduction to Student Personnel Work in Higher Education.* I. 3 hr. PR: Consent. A historical and topical study of the development of student personnel structure and functions in higher education.
- 320. *Lifespan Career Counseling.* II, S. 3 hr. PR: Coun. 303, 305. Principles and methods involved in career counseling with diverse populations. Emphasis on theories of career development and life-style planning, career choices, and life-long work adjustment.
- 330. *Counseling Children.* I, S. 3 hr. PR: Consent. Practical application of the principles of guidance to the elementary school.
- 331. *Consultation Theory and Techniques.* II, S. 3 hr. PR: Coun. 306 and consent. A specialized multiple training experience covering advanced theory, techniques and practices, skill development in teacher, and parental consulting.
- 382. *Special Topics.* I, II, S. 1-6 hr. PR: Advanced standing and consent. Independent study and directed readings in specialized areas of counseling and guidance. (Some sections of Coun. 382 have prerequisite requirements. Check with the instructor.)
- 385. *Practicum.* I, II, S. 1-12 hr. PR: Preregistration; liability insurance; cleared for internship at close of semester, or M.A. degree, and consent of department practicum evaluation committee. An intensive supervised practical experience in public schools or agencies, in counseling with individual critique and appropriate small-group experiences. Demonstration of high professional standards, counseling skills, and personal characteristics appropriate to the counseling relationship are essential. (Due to the limited number of summer sites, there can be no guarantee of summer practicum placement.) [Practicum is a prerequisite for internship placement. Internship is a one-semester, minimum four-day per week field experience following practicum. This two-semester sequence replaces the previous one-semester practicum.]
- 391. *Advanced Topics.* I, II, S. 1-6 hr.
- 395. *Problem in Counseling and Guidance.* I, II, S. 1-12 hr. PR: Consent. Study and research for master's degree in counseling and guidance.

Counseling Psychology (CPsy)

- 401. *Advanced Counseling Psychology Techniques.* I. 3 hr. PR: Advanced standing and consent. Comprehensive development of counseling psychology techniques related to generic and specific theoretical models. In-setting laboratory demonstration of therapy techniques required.
- 409. *Advanced Group Counseling/Therapeutic Techniques.* 3 hr. PR: Consent. An overview of the formation, leadership techniques, research and ethical issues associated with group counseling and psychotherapy in general and for specific populations. 3 hr. lec.
- 431. *Advanced Consultation Techniques.* I. 3 hr. PR: Coun. 331 or equiv., or consent. Multiple training and experiences in theories and techniques of consultation and delivery of human services to educational and community personnel. Simulated classroom and laboratory experiences.
- 460. *Introduction to Counseling Psychology.* 2 hr. PR: Consent. An overview of the history, current status and future trends associated with counseling psychology as a specialty area. 2 hr. lec.
- 463. *Advanced Theories of Counseling Psychology.* II, S. 3 hr. PR: Coun. 385; admission to graduate study; and consent. A comprehensive study of the theoretical issues in contemporary counseling.

464. *Intellectual Assessment*. II. 4 hr. PR: Advanced standing and preregistration with instructor (9 hr. psychology, and demonstration of proficiency in measurement needed for admission). Administering, scoring, and interpreting individual intelligence tests.

466. *Vocational Psychology*. II. 3 hr. PR: Coun. 320 or equiv., advanced standing or consent. Advanced study of theory development and research in vocational psychology and counseling; emphasis on counseling psychology, women's issues and cross-cultural counseling.

469. *Personality Testing and Interpretation*. I. 3 hr. PR: Coun. 305 and consent. Advanced study in the application of personality assessment procedures and consideration of alternative methods for measuring human behavior.

470. *Doctoral Practicum in Counseling Psychology*. 1-9 hr. PR: Consent. Intensive clinical experience in which students under supervision see clients for individual and group counseling and psychotherapy. Practica is offered at a variety of approved field-based sites. 1-9 hr. practicum.

472. *Internship*. I, II, S. 1-12 hr. PR: Written approval from the Department Internship Committee, satisfactory completion of written doctoral comprehensive exams and approval of research prospectus. Full-time supervised practice in an approved counseling psychology internship training program; minimum duration one academic year.

480. *Seminar*. I, II, S. 1-6 hr. PR: Advanced standing and consent. Seminar in counseling psychology for students in certificate of advanced study and doctoral programs.

482. *Research Practicum in Counseling Psychology*. 1-6 hr. PR: Consent. The conduct of a descriptive or an experimental study. An overview of research design, statistical procedures, potential violations of ethical principles in the conduct of research. 1-6 hr. practicum.

483. *Counseling Psychology Supervision Models*. I. 3 hr. PR: Coun. 401, advanced standing and consent. Overview of major assumptions and techniques of major counseling supervision models. Training activities include simulated and actual demonstrations of each of the supervision models and critique of their assumptions, advantages, and constraints.

490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility in counseling psychology.

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced areas of counseling psychology and rehabilitation counseling.

492. *Professional and Ethical Issues in Counseling Psychology*. II. 3 hr. PR: Advanced standing and consent. Overview of current ethical, legal, and professional issues in counseling psychology. Readings, discussion, and a written literature review of a topic related to the practice of counseling psychology.

496. *Graduate Seminar*. I. 3 hr. PR: Advanced standing and consent. Written and oral presentation of methodology and results of one's own research study with supervision and critique by the instructor and members of the seminar.

497. *Research*. I, II, S. 1-15 hr. PR: Consent. Dissertation.

498. *Thesis*. I, II, S. 2-4 hr. PR: Consent.

499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not registered in regular course work but who have need to use University facilities for completion of their research or program.

DENTAL HYGIENE

Barbara K. Komives, Chairperson of the Department

Christina B. DeBiase, Coordinator of the Graduate Program

1073 Health Sciences Center North

Degree Offered: Master of Science

Graduate Faculty: Members DeBiase, Gladwin, Graves, Komives, and Mueller

Areas of Specialization

Office Management

Special Patients

Education/Administration

Basic Sciences

The School of Dentistry and its Department of Dental Hygiene offer a program of advanced study and specialized training leading to the degree of master of science. This program requires a minimum of 36 semester hours through full-time or part-time enrollment in the School of Dentistry. It is designed to qualify dental hygienists for careers in teaching, administration, research and management.

Inquiries concerning this program should be directed to the Office of the Associate Dean for Research and Graduate Affairs, School of Dentistry. Applications should be filed by July 1 for fall admission and by November 1 for spring enrollment.

Requirements for Admission to the Dental Hygiene Program

1. A baccalaureate degree in dental hygiene from an accredited dental hygiene program or a baccalaureate degree in another field of study from an approved institution of higher education while holding a certificate or associate degree in dental hygiene from a program fully accredited by the American Dental Association, Commission on Dental Accreditation.

2. Evidence of scholastic and clinical achievement to indicate the applicant's ability to progress in a program of this nature. Generally, a minimum grade-point average of 2.5 or above is required.

3. Completion of one of these standardized tests: the Graduate Record Examination (GRE) general aptitude test with a score of 1,000 or above or the Miller's Analogy Test with a score of 50 or above.

4. Submission of all information requested in the graduate application to the Office of the Associate Dean.

Requirements for Degree of Master of Science

1. Completion of a minimum of 36 semester credit hours: 18-24 required credit hours and 12-18 credit hours in an elective area(s) of specialization. The student may choose one or two from the four elective areas of specialization offered. These courses are taught by a number of schools within the University. An individualized program will be devised for each student which must conform to one of these options:

a. Thesis: A minimum of 30 semester credit hours, plus a maximum of six hours in research leading to an acceptable thesis. Oral defense of the thesis is required.

b. Non-thesis: At least 36 semester credit hours, with no thesis.

2. Successful completion of a comprehensive examination for non-thesis students. The series of tests covers all areas specified in the plan of study.

This examination will be administered after the majority of the student's coursework has been completed.

3. Achievement of a 3.0 GPA or an overall academic average of at least B in all work attempted in the master's program. A grade of C or below in two courses will require a faculty review of the student's progress. A third C will result in suspension from the program.

4. Removal of all conditions, deficiencies and incomplete grades. Credit hours for courses with a grade lower than C do not count toward degree requirements.

M.S.D.H. Curriculum

Basic Requirements	Credit Hours
Educational Psychology 311—Statistics	3
Educational Psychology 330—Test and Measurement	3
Dental Hygiene 380—Critical Issues in Health Care	3
Dental Hygiene 381—Expanded Functions	3
Dental Hygiene 220—Personal Computing for the D.H.	3
Dental Hygiene 385—Research Methods for the D.H.	3
Dental Hygiene 397—Research (Thesis)	<u>(6)</u>
	18-24

Elective Area(s) of Dental Hygiene Specialization

Dental Hygiene 391 and Dentistry 397 Courses

Courses taught by the School of:

Business and Economics

Human Resources and Education

Medicine

Courses taught by the Department of Community Health

Multidisciplinary Studies Courses

12-18

TOTAL **36**

Dental Hygiene (Dnt. Hy.)

220. *Microcomputing for Dental Hygienists.* II, S. 3 hr. PR: Consent. Introduction to microcomputing with hands-on experiences in patient record keeping, accounting, insurance handling and word processing.

380. *Dental Hygiene Seminar and Practice 1.* I. 3 hr. PR: Graduate standing and consent. Examination of the critical environmental issues affecting the future of health care; particular impact on oral health care trends will form major focus. Dental hygiene clinical practice is also included.

381. *Dental Hygiene Seminar and Practice 2.* II. 3 hr. PR: Dnt. Hy. 380. Expanded services for the dental hygienist with emphasis on restorative and periodontal functions.

385. *Research Methods for the Dental Hygienist.* II. 3 hr. PR: Ed. Psych. 311. Methods and techniques of research in dental hygiene. Major emphasis on planning and evaluating health programs, conducting oral health surveys, designing experiments and critically analyzing research results.

397. *Dental Hygiene Research.* I, II, S. 3-6 hr. PR: Consent. Students will design a research protocol, conduct experimental research and prepare a thesis of original dental hygiene research.

ECONOMICS

Jay H. Coats, Director of Graduate Programs
333 Business and Economics Building

Graduate Programs in Economics, College of Business and Economics,
West Virginia University, P.O. Box 6025, Morgantown, WV 26506-6025

Telephone: (304) 293-5408

Degrees Offered: Master of Arts

Doctor of Philosophy

Graduate Faculty: Members Adams, Bhandari, Cushing, Hawley, Hwang, Isserman, Kymn, Mann, Mitchell and Witt. Associate Members: Britt, Hariharan, Rupert, Trumbull, and Wall.

The Master of Arts and Doctor of Philosophy degrees in economics enable students to broaden and refine their knowledge of the concepts and methods of economic analysis. These programs are designed to prepare students for careers in business, government, and higher education. Student programs are planned with the assistance of a faculty adviser and approval of the Director of Graduate Programs. Additional information about the graduate programs in economics, and the regulations and requirements pertaining to them, may be obtained by securing a copy of "Graduate Programs in Economics" from the graduate director. Students are bound by these regulations and requirements, as well as those of the College of Business and Economics.

Admission. To be admitted as a regular student, applicants must have a grade-point average of 2.75 or better for all undergraduate work completed and a minimum combined score of 1500 for the three parts of the general aptitude portion of the Graduate Record Examination. All students must submit their scores on the general aptitude portion of the Graduate Record Examination (GRE) and international students must also submit their scores on the TOEFL. In addition, it is required that all applicants will have completed at least one semester of each of the following courses: intermediate microeconomic theory, intermediate macroeconomic theory, calculus, and statistics. Applicants not meeting these entrance requirements may be admitted on a provisional and/or deficiency basis, subject to certain performance conditions during their first semester in residence.

Financial Aid. A limited number of graduate assistantships and tuition scholarships are available on a competitive basis to full-time students. Major selection criteria include prior academic performance and GRE scores. Graduate assistants receive a cash stipend that is comparable in amount to that offered at other universities. Graduate assistants engage in research and/or teaching activities. The faculty of the Department of Economics also nominates outstanding applicants for University fellowships. Special scholarships are also available on a competitive basis to minority students. Further information and applications can be obtained from the Director of Graduate Programs.

Academic Performance. To qualify for a graduate degree in economics, students must earn a cumulative grade-point average (GPA) of 3.0 or better for all courses completed as a graduate student at WVU. A regular graduate student in economics whose cumulative GPA falls below 3.0 (B) upon completion of the first nine hours of graduate study is not in good standing and will be placed on probation. A student in the program whose cumulative GPA falls below 3.0 will be placed on probation as of the close of the semester in which the GPA fell below 3.0. Such a student, placed on probation, who fails to raise his/her cumulative GPA to 3.0 by the end of the semester succeeding

that in which his/her GPA fell below 3.0 is subject to suspension from the program at the end of that probationary semester.

Other academic reasons for suspension from the program include failing grades on more than 50 percent of the course work taken in any semester, a third failure on either a microeconomic theory or macroeconomic theory comprehensive examination, a fourth failure on comprehensive field examinations, or failure to complete all degree requirements within the specified time limits.

Master of Arts (M.A.)

The Master of Arts (M.A.) program requires a total of 36 hours of graduate credit, including 21 hours of economics. At least 24 hours of course work completed must be at the 300 level. To qualify for the M.A. degree, graduate students in economics must earn a grade of B- or better in Economics 310 and 312, and a grade-point average of 3.0 in all courses attempted as a graduate student at WVU. The M.A. program contains a thesis and a nonthesis option. Specific course requirements include:

Core Courses—

Economics 220—Introduction to Mathematical Economics, 3 hr.

Economics 310—Advanced Microeconomic Theory 1, 3 hr.

Economics 312—Advanced Macroeconomic Theory 1, 3 hr.

Economics 316—History of Economic Doctrines and Analysis, 3 hr.

(If the student has recently successfully completed Economics 216 *History of Economic Thought* or its equivalent before entering the M.A. program, the Economics 316 requirement may be waived by approval of the graduate director.)

Statistics Requirement—(six credit hours are required.)

Option A:

Statistics 231—Sampling Methods, 3 hr.

Economics 226—Applied Econometrics, 3 hr.

Option B: For students who consider going into the Ph.D. Program.

Economics 320—Mathematical Economics, 3 hr. (substitute for Economics 220 in the core)

Statistics 262—Theory of Statistics, 3 hr.

Economics 325—Econometrics, 3 hr.

Thesis/Nonthesis Options—

a. Thesis Option: An acceptable thesis, 6 hr. With the thesis option, the student must pass a final oral examination.

b. Nonthesis Option: In lieu of a thesis, the requirements for the M.A. are met by: (1) completion of two 300-level courses in one field of concentration in economics; and (2) submission of a research paper that gives evidence of substantial ability to conduct scholarly research.

M.A. Program Options

The M.A. program in economics includes special options administered by the College of Business and Economics jointly with other units on campus. These options include business analysis, mathematical economics, public policy, and statistics and economics. To earn the M.A. in economics, students must complete the M.A. requirements (above) and fulfill other requirements pertaining to the particular option. The options are best viewed as coherent sample programs developed in conjunction with other units and are designed to prepare students for employment in a particular area or specialty of economics.

Business Analysis—Conducted in cooperation with other departments of the College of Business and Economics, this option is designed to prepare students for employment in the business analysis area. As part of their M.A. program in economics, students complete 13 hours of business courses: Financial Accounting, Managerial Finance, Corporate Financial Administration, Organizational Behavior and Ethics, and Marketing Management.

Mathematical Economics—This option is conducted in cooperation with the Department of Mathematics. Students entering this option must previously have taken 12 hours in mathematics, including a course in calculus equivalent to Math. 15. Courses include Advanced Micro Theory 2, Advanced Macro Theory 2, Econometrics, Mathematical Economics, Applied Linear Algebra, and Introduction to Real Analysis.

Public Policy—This option is conducted in cooperation with the Department of Political Science and provides students with broad training in policy analysis skills and methods. Prior completion of at least six hours of political science coursework is required. Courses include Introduction to Policy Research, Public Policy Analysis, and Economic Analysis of Public Policies.

Statistics and Economics—Conducted in cooperation with the Department of Statistics and Computer Science, this option is designed to prepare students for employment in the public or private sector which demands the use of quantitative skills. Courses include Statistics, Probability, Applied Regression Analysis, and Econometrics.

Doctor of Philosophy (Ph.D.)

Usually four years of full-time graduate work beyond the baccalaureate degree are required to complete the doctorate. A minimum of two consecutive semesters in actual residence as a full-time graduate student is required. To qualify for the Doctor of Philosophy (Ph.D.) degree in economics, a student must earn a cumulative grade-point average of 3.0 in courses completed as a graduate student at WVU.

The Ph.D. degree is not awarded for the mere accumulation of course credits nor for the completion of the specified residence requirements. All students are required to complete the graduate core curriculum, prepare themselves in three fields of concentration, and submit an acceptable dissertation. A minimum of 39 hours of graduate work in economics at the 300 level is required for all candidates for the Ph.D. degree in economics.

Core Courses (each, 3 hr.):

- Economics 310—Advanced Microeconomic Theory 1
- Economics 311—Advanced Microeconomic Theory 2
- Economics 312—Advanced Macroeconomic Theory 1
- Economics 313—Advanced Macroeconomic Theory 2
- Economics 316—History of Economic Doctrines and Analysis
- Economics 320—Mathematical Economics
- Economics 325—Econometrics 1
- Statistics 262—Theory of Statistics

Fields of Concentration. Six semester hours (or the equivalent) must be taken in each of the student's three fields of concentration. Areas of concentration include: econometrics, monetary economics, public finance, regional and urban economics, labor economics, international economics, and mathematical economics. One of the fields of concentration may be in a outside area; selection must be approved by the graduate economics faculty.

Comprehensive Examinations. Students must pass written comprehensive examinations in economic theory (microeconomics and macroeconomics) and

in three fields. For possible waiver of one field examination, and other detailed rules, see departmental "Graduate Programs in Economics" filed in the Office of Graduate Director.

Candidacy and Dissertation. When an applicant has successfully passed the written comprehensive examinations, the applicant will be formally promoted to candidacy for the Ph.D. degree. The candidate must submit a dissertation pursued under the supervision of a member of the graduate faculty in economics on some problem in the area of the candidate's major interest. The dissertation must present the results of the candidate's individual investigation and must embody a definite contribution to knowledge. It must be approved by a committee of the graduate faculty in economics. After approval of the candidate's dissertation and satisfactory completion of other graduate requirements, a final oral examination on the dissertation is required.

Each Ph.D. candidate is required to present a dissertation proposal to the Graduate Director subsequent to approval by at least three members of his or her dissertation committee including the chairperson. This proposal will include a statement of the problem (topic summary), a preliminary survey of the literature, a description of the research methodology, and other pertinent material. With the approval of the graduate director, the student is then required to present the proposal in a faculty-student seminar.

Credit for dissertation research and writing is available under Economics 497, but only if the student has a dissertation chairperson and the approval of the graduate director.

Ph.D. Program Options

The Ph.D. program includes special options conducted in cooperation with other units on campus. These are industrial and labor relations, and mathematical economics. The options specify certain concentrations of course work and comprehensive examinations. Acceptable dissertations are required of all students.

Industrial and Labor Relations—Graduate work in industrial and labor relations typically is interdisciplinary in nature. The Ph.D. option retains the interdisciplinary orientation while providing students with a Ph.D.-level of understanding of economic theory and economic analysis. Students in the industrial and labor relations option take the eight core courses in the Ph.D. program and take comprehensive examinations in microeconomic and macroeconomic theory.

Students are required to complete three fields of concentration. One field must be Industrial and Labor relations, which consists of the following courses:

Industrial and Labor Relations 334—Leadership and Work Group Dynamics

Industrial and Labor Relations 342—Advanced Collective Bargaining

Industrial and Labor Relations 491A—Practicum in Research Methods

Industrial and Labor Relations 491B—Research Theory

Of the two remaining fields, each typically six credit hours, one must be from within the Department of Economics. Most commonly, this field is labor economics. The second field may be selected from economics, industrial psychology, public administration, statistics, human resources management, industrial engineering, or law, and ideally should complement the student's research interest.

Students must pass written comprehensive examinations in their three fields of concentrations.

Mathematical Economics—The mathematical economics option is conducted in cooperation with the Department of Mathematics. To be admitted into this option, students must have completed a minimum of 12 hours in mathematics, including a course in calculus equivalent to Mathematics 15. In addition to the Economics Ph.D. core, students are required to take the following courses:

- Economics 326—Econometrics 2
- Economics 328—Advanced Mathematical Economics
- Economics 329—Seminar in Econometrics
- Mathematics 241—Applied Linear Algebra
- Mathematics 251, 252—Introduction to Real Analysis
(Math. 251 and 252 may be replaced by Math. 317, 318.)
- Mathematics 357—Calculus of Variations
- Mathematics Elective—3 hr.

Students are required to successfully complete comprehensive examinations in microeconomic and macroeconomic theory, mathematical economics, econometrics, and one other field in economics.

For further details, see "Graduate Programs in Economics" Appendix B, Ph.D. options, Mathematical Economics.

Economics (Econ.)

Specialized Courses

- 200. *Special Topics.* 1-4 hr. PR: Econ. 51 or 55 or consent. Special topics relevant to economics. (Maximum of nine semester hours in any or all courses numbered 200 offered by the College of Business and Economics may be applied toward bachelor's and master's degrees.)
- 297. *Internship.* 1-12 hr. PR: Econ. 51 or 55 and departmental approval. Field experience in the analysis and solution of economic problems in the public and private sectors.
- 317. *Economic Decision Making.* 2 hr. PR: Econ. 54 or consent. (Non-credit for Graduate students in Economics.) Analysis of the firm as an optimizing unit operating in the market place. Examination of product demand, production and costs, pricing theory and practice theory and practices, risk and capital budgeting.(Open only to MBA and MSLIR students.)
- 318. *Economic Policy.* 2 hr. PR: Econ. 317 or consent. (Non-credit for Graduate students in Economics.) Microeconomic analysis of macroeconomic phenomena is considered with particular attention paid to the reaction by firms to price and interest rate effects of fiscal and monetary policy.(Open only to MBA and MPA students.)
- 319. *Applied Business and Economics Statistics.* 3 hr. PR: Consent. Primary statistical methods used in business and economics research including hypothesis testing, estimation, linear regression, time series, and business forecasting. Statistical computer software is an integral part of the course.(Open only to MBA,MPA, and MSLIR students.)
- 343. *Economic Analysis of Public Policies.* 3 hr. Application of economic analysis to questions of public policy. Consideration of problems of public goods and other market failures and usefulness of cost-benefit analysis to policy-making. (Equiv. to Pol. S. 331.)

Economic Theory

211. *Intermediate Microeconomic Theory*. 3 hr. PR: Econ. 51 or 54. Consumer choice and demand; economics of time; price and output determination and resource allocation in the firm and market under a variety of competitive conditions; welfare economics, externalities, public goods, and market failure.

212. *Intermediate Macroeconomic Theory*. 3 hr. PR: Econ. 51 or 55. Forces which determine the level of income, employment, and output. Particular attention to consumer behavior, investment determination, and government fiscal policy.

216. *History of Economic Thought*. 3 hr. PR: Econ. 51, 55. Economic ideas in perspective of historical development.

310. *Advanced Micro Theory 1*. 3 hr. PR: Econ. 211 or 220 and graduate standing or consent. Theory of production and allocation, utility theory, theory of the firm, pricing in perfect and imperfect markets, models of firm's operations.

311. *Advanced Micro Theory 2*. 3 hr. PR: Econ. 310. General equilibrium analysis, distribution theory, welfare economics.

312. *Advanced Macro Theory 1*. 3 hr. PR: Econ. 212 and 220 and graduate standing or consent. Classical, Keynesian, and Post-Keynesian theories.

313. *Advanced Macro Theory 2*. 3 hr. PR: Econ. 312. Model of economic growth and fluctuations, and other advanced topics in macroeconomic theory.

316. *History of Economic Doctrines and Analysis*. 3 hr. PR: Econ. 310 and graduate standing or consent. Writings of the major figures in the development of economic doctrines and analysis.

Quantitative Economics

220. *Introduction to Mathematical Economics*. 3 hr. PR: Math. 15 or 128, and Econ. 51 or 55; or consent. Principal mathematical techniques including set operation, matrix algebra, differential and integral calculus employed in economic analysis. Particular attention given to static (or equilibrium) analysis, comparative-static analysis and optimization problems in economics.

225. *Applied Business and Economic Statistics*. 3 hr. PR: Econ. 125 or Stat. 101 or consent. Continuation of Econ. 125. Principal statistical methods used in applied business and economic research including multiple regression, index numbers, time series analysis, forecasting models and methods, and sampling design.

226. *Introductory Econometrics*. 3 hr. PR: Econ. 125 or consent. Statistical methods applied to the analysis of economic models and data. Emphasis placed on multiple regression, multicollinearity, seasonality, heteroscedasticity, autocorrelation, dummy variables, time series analysis, distributed lags and simultaneous equations with economics and computer applications.

320. *Mathematical Economics*. 3 hr. PR: Econ. 220 or consent. Linear programming, input-output analysis, complex numbers, linear difference and differential equations, comparative-static and dynamic analysis and optimization techniques.

325. *Econometrics 1*. 3 hr. PR: Stat. 262 or consent. Specification, estimation, and verification of single-equation models. Topics covered include multicollinearity, autocorrelation, heteroscedasticity, dummy variables, time series analyses and forecasting, functional form, and specification error analysis. Students should be familiar with matrix algebra.

326. *Econometrics 2*. 3 hr. PR: Econ. 325 or consent. Identification and estimation of simultaneous equation models and their use in forecasting and simulation. Other advanced topics include distributed lags, autoregressive models, errors in variables models, aggregation problems, and pooled cross-section/time-series models.

328. *Advanced Mathematical Economics.* 3 hr. PR: Consent. Mathematical properties of microeconomic models of general equilibrium and welfare, existence, uniqueness, and stability of equilibrium. Applications of Hamiltonian and maximum principles to growth models and economic control problems. Investigation of separability theorems.

329. *Seminar in Econometrics.* 3 hr.

Monetary Economics

330. *Monetary Economics.* 3 hr. PR: Econ. 312 or consent. Sources and determinants of supply of money; demand for money for transactions and speculative purposes; general equilibrium theory of money, interest, prices, and output; role of money in policy.

334. *Seminar in Monetary Economics.* 3 hr. PR: Econ. 312 or consent.

Public Finance

241. *Public Finance.* 3 hr. PR: Econ. 51 or 55. Governmental fiscal organizations and policy; taxes and tax systems with particular emphasis on federal government and state of West Virginia.

340. *Theory of Public Finance.* 3 hr. PR: Econ. 310 and graduate standing or consent. Economic role of government in a mixed economy with regard to resource allocation between public and private sectors, influence of government upon income distribution and economic stability and growth.

344. *Seminar in Public Finance.* 3 hr.

Public Regulation and Control

245. *Government and Business.* 3 hr. PR: Econ. 51 or 55. Market structure, conduct and performance: analysis of the antitrust laws—judicial interpretation and effect on the business sector.

246. *Transportation Economics.* 3 hr. PR: Econ. 51 or 55. Economic and institutional analysis of the domestic transportation system of the United States. Topics include role of transportation, carrier characteristics and services, transportation rates and costs, regulation of transportation.

345. *Industrial Organization.* 3 hr. PR: Econ. 310 and graduate standing or consent. Economic analysis of market structure, conduct, and performance: in-depth evaluation of markets and industries in the United States and the effect of government intervention on firm behavior.

349. *Public Regulation of Business.* I or II. 3 hr. Economic analysis of regulation of specific industries such as public utilities.

International Economics

250. *International Economics.* 3 hr. PR: Econ. 51 or 55. Development of trade among nations; theories of trade, policies, physical factors, trends, and barriers in international economics.

350. *Advanced International Economics.* 3 hr. PR: Econ. 211 and 212. Contemporary theories of international economics; analysis of current problems in world trade and finance.

354. *Seminar in International Economics.* 3 hr. PR: Econ. 212.

Regional Economics

255. *Regional Economics.* 3 hr. PR: Econ. 51 or 55. Analysis of the regional economy's spatial dimension, emphasizing interregional capital and labor mobility, the role of cities, objectives and issues of regional policy, lagging regions and Appalachia, growth poles, and regional growth and income distribution.

257. *Urban Economics*. 3 hr. PR: Econ. 51 or 55. Analyzes the spatial dimensions of the urban economy, emphasizing both urban economic theory and urban policy. Issues include cities and income inequality, urban upgrading function, blight, economics of ghettos, the economics of urban size.

355. *Advanced Regional Economics*. 3 hr. PR: Econ. 310 and graduate standing or consent. Regional income and flow of funds estimation, regional cyclical behavior and multiplier analysis, industrial location and analysis, techniques of regional input-output measurement, impact of local government reorganization on regional public service and economic development.

357. *Advanced Urban Economics*. 3 hr. PR: Econ. 310 and graduate standing or consent. Analyzes the spatial dimensions of the urban economy, emphasizing urban theory, policy, and empirical research. Major subjects include urban income distribution, residential location theory, spatial structure, neighborhood change, blight, ghettos, segregation, renewal, and city size.

359. *Seminar in Regional Economics*. 3 hr.

Labor Economics

360. *Advanced Human Resource Economics*. 3 hr. PR: Econ. 310 and graduate standing or consent. Examination and analysis of our social and economic efforts to solve current manpower problems in the U.S., including structural unemployment and inflation.

364. *Seminar in Labor Economics*. 3 hr. PR: Econ. 310 and graduate standing or consent.

Economic History

270. *Growth of the American Economy*. 3 hr. PR: Econ. 51 or 55. Central issues in development of the American economy.

370. *Economic History*. 3 hr. Examination of the methods of research and issues in economic history of the United States.

374. *Seminar in Economic History*. 3 hr.

Economic Development

213. *Economic Development*. 3 hr. PR: Econ. 54 and 55. The problems, changes, and principal policy issues faced by nonindustrialized countries.

Energy and Environmental Economics

380. *Energy Economics*. 3 hr. PR: Graduate standing and consent. Welfare analysis of supply interruptions and the foreign dependence question. Study of various energy resources in reference to policy alternatives under variant growth conditions and input-output models. Examination of coal industry and coal externalities.

384. *Environmental Economics*. 3 hr. PR: Econ. 310 and Econ. 380 or M.E.R. 345 and graduate standing or consent. Examination of the theoretical and empirical literature dealing with externalities (pollution), the relationships between pollution and social costs, the relationships between energy production and environmental quality, and the optimal strategies for pollution abatement.

Other Economics Courses

299. *Independent Readings in Economics*. 3-6 hr. Supervised readings for undergraduate and graduate students in special areas.

390. *Independent Reading in Economics*. 3-6 hr. Supervised readings. For graduate students in special areas.

491. *Seminar in Applied Economic Analysis*. 3 hr. PR: 12 hr. of graduate-level economics.

497. *Research*. 1-15 hr.

EDUCATION

Diane L. Reinhard, *Dean of College of Human Resources and Education*
802 Allen Hall

Degrees Offered: Certificate of Advanced Study, Doctor of Education
(M.A. and M.S. programs are listed separately, by program major.)

Graduate Faculty: Members Andes, Atkins, B. Bailey, Baker, Barksdale, Bilow, Bonk, Bower, Childress, S. Cormier, W. Cormier, Deay, DeCosta, DeVore, Fraley, Gerlach, Gibbins, Goeres, Haas, Hartnett, Hazi, Hoffman, Holtan, Hursh, Ianonne, Jacobs, Koay, Lass, Leary, Lilley, Lombardo, Ludlow, Lundeen, McAvoy, McCrory, Majumder, Marinelli, Martin, Masson, Maughan, Meckley, Monahan, Moriarty, Moxley, A. Nardi, G. Nardi, Neal, Obenauf, Phillips, Pytlik, Reed, Reinhard, Rinehart, Ruscello, Saltz, Shea, Shuster, E. R. Smith, P. Smith, Srebalus, Stepp, St. Louis, Thomas, Tseng, Tunick, E. Vargas, J. Vargas, Vickers, Walls, Wienke, Woodford, Woodrum, Yeager, Young, and Yura. Associate Members N. Bailey, Bickel, Carline, Coombe, DeLo, Doherty, Freeman, Goodwin, Gordon, Greever, Hall, Hayes, Heitzenroder, Hobbs, Hunt, Lombardo, Meikamp, Messing, Murray, Paterson, Savage, Sawyer, Shuman, Sloane, Spatig, Stead, Sullivan, Toth, Wilkin, Wolf, and Wolfe.

Certificate of Advanced Study (C.A.S.)

This program is designed to prepare school and related personnel who wish professional training beyond the master's degree. Candidates for the certificate of advanced study in education may choose from among the following areas of study for their area(s) of concentration: administration and supervision, curriculum and instruction, counseling and guidance, educational psychology, reading, or special education. Persons interested in the certificate should consult with the chairpersons of the appropriate department or the Dean of the College of Human Resources and Education.

Doctor of Education (Ed.D.)

The program of study leading to the degree of doctor of education (Ed.D.) is planned with the student's graduate adviser and committee and is made available through the faculty and support services of the College of Human Resources and Education. It combines courses of instruction, seminars, supervised research, and ancillary experience intended to provide the candidate with a variety of educationally related competencies. Special requirements, such as tools of research, also may be specified by the student's committee.

College facilities and faculty expertise make it possible for students wishing to do so to concentrate more heavily in such fields as curriculum development, counseling and guidance, education administration, rehabilitation services, special education, and technology education.

Curriculum and Instruction

Options in curriculum and instruction are available for the C.A.S., the Ed.D., and the various M.A. programs. Since the development of curricula and teaching methodology is central to all levels of education, specific tracks in curriculum and instruction have been designed for elementary, secondary, and reading options in the masters' programs offered by the Division of Education. In addition, discrete subject areas may also serve as the core of specialization within curriculum and instruction.

Additional information about curriculum and instruction within the Division of Education may be obtained through writing to:

W. Michael Reed
Interim Chairperson of Graduate Programs
Division of Education
602 Allen Hall, P.O. Box 6122
West Virginia University
Morgantown, WV 26506-6122

EDUCATION ADMINISTRATION

Richard A. Hartnett, Chairperson
606 Allen Hall

Degrees Offered: Master of Arts, Area of Emphasis for Doctor of Education

Graduate Faculty: Members Andes, Callebs, Childress, Gibbins, Goeres, Hartnett, Hazi, Leary, Lillely, Martin, Meckley, Monahan, Neal, Nitzschke, E. R. Smith, Stepp, Sullivan, and Wilkin. Associate Members N. Bailey, Goodwin, Gordon, Hall, Hayes, Hunt, Sloane, Toth, J. E. Yeager, and Young.

The education administration program prepares individuals for leadership positions primarily in elementary, secondary, and postsecondary institutions. Although most students are pursuing administrative careers, some are training for research or staff positions. The unit offers graduate programs leading to the master of arts and for certification in principalship, supervision, and superintendency. Upon admission to the program, all students are assigned an academic adviser. All students should contact their adviser for specific program and certification requirements.

At all degree levels, the program is dedicated to the preparation of outstanding individuals to administer and improve education.

Graduates of education administration occupy such prominent positions as:

1. Administrative posts in school systems as superintendents, supervisors, and principals.
2. Administrative posts in colleges and universities, including general administration, academic affairs, financial affairs, student affairs, adult and continuing education, and institutional research and planning.
3. Administrative posts in governmental and public service agencies, including the West Virginia Department of Education, regional educational service agencies, and vocational rehabilitation agencies.

Applicants must comply with the WVU requirements, the requirements of the College of Human Resources and Education, and the education administration program. Admission to all programs is contingent on assessment of complete official transcripts of all higher-education work attempted and other evidence the faculty may deem necessary to judge probable success in the graduate program.

Master of Arts (M.A.)

Optional programs are available in public school administration and supervision, higher education administration, and extension and continuing education. A two-semester, field-based experience is required before permanent professional certification can be acquired in public school administration and supervision. In order to graduate, the student must earn at least a 3.25 grade-point average on all program work attempted. Students seeking WV

certification must pass a West Virginia Department of Education content specialization examination upon completion of their academic program.

Certificate of Advanced Study Concentrations

Advanced work beyond the master's degree may be taken with emphasis in school district central office administration or in principalship. A research project or a six-hour planned field-based experience is required. In order to graduate, the student must defend the research project and earn at least a 3.25 grade-point average on all program work attempted.

Doctor of Education Concentrations

The doctor of education degree is offered with tracks in public school administration, higher education, and related educational organizations (such as state departments of education). Consistent with the regulations of the University, the College of Human Resources and Education, and the program of education administration, each track is individually designed by the doctoral student, the student's adviser, and the doctoral committee to meet the student's career aspirations.

Education Administration (Ed. A.)

300. *Public School Organization and Administration.* I, II, S. 3 hr. Basic concepts through which administrators, supervisors, and teachers gain understanding of general problems related to operation of schools and school systems.
318. *School Business Administration.* I, II, S. 3 hr. PR: Consent. Sound business administration for central office school administrators.
320. *Personnel Administration.* I, II, S. 3 hr. PR: Consent. The determination of student, employee, and organizational personnel needs and the development of plans and programs to meet these needs.
330. *Principles of Education Leadership.* I, II, S. 3 hr. PR: Consent. Problems of school leaders in the areas of administration, supervision, and instruction.
331. *Principles of Supervision.* I, II, S. 3 hr. PR: Consent. Elementary, junior high, and senior high supervision.
333. *School Law.* I, II, S. 3 hr. PR: Consent. Overview of the generally accepted legal principles which affect the student, teacher, and principal in a public school setting.
334. *College Student and the Courts.* 3 hr. PR: Consent. A study of the major areas of higher education law from the perspective of the college student. A case study approach.
335. *Introduction to College Student Personnel.* 3 hr. PR: Consent. A study of the organization and administrative functioning components, concepts, and models of student personnel administration systems using a historical and topical approach. Conceptual approach based upon the student development model.
336. *Funding Raising and Foundation Management.* 3-6 hr. PR: Consent. (Fall, even years) Studies in fund raising, alumni relations, and foundation management. (Also listed as Journ. 312.)
351. *Administrative Procedures in Adult Education.* I, II, S. 3 hr. PR: Consent. (Offered off-campus only.) Theories and principles of administering adult education organizations as they relate to planning, organizing, staffing, initiating, delegating, integrating, motivating, decision making, communicating, establishing standards, financing, budget defense and control, and measuring results.

352. *Professionalism in Extension Service.* II, S. 3 hr. PR: Consent. (Offered off-campus only.) Role of Extension Service professionals in social change, study community systems; professional relationships, accountability, ethics, obligations to clientele.

353. *Community Education: Administration and Organization.* I. 3 hr. PR: Consent. (Offered off-campus only.) Study of the rationale, methods, and procedures in administering and programming community education. Experiences in planning, adapting, and evaluating programs independently and in consort with school and community plans.

373. *Professional Development.* I, II, S. 1-6 hr. (May be repeated for credit.) PR: Department consent. Specially designed experiences for those interested in advancing professional skills in a particular specialty. (Not for degree credit in programs in the College of Human Resources and Education.)

380. *Topics in Supervision.* 3 hr. Special knowledge and skills for supervisors K-12 including media, computers, reading, multicultural education, testing, and special education.

385. *Practicum.* I, II, S. 1-12 hr. PR: Consent.

388. *Research-Evaluation-Assessment.* I, II, S. 3 hr. PR: Consent. Research, evaluation, and assessment procedures related to administrative decision making and problem solving to increase the general effectiveness of educational institutions.

389. *School-Community Relations.* I, II, S. 3 hr. PR: Consent. A study of the systems through which the school can be interpreted to its community.

391. *Advanced Topics.* I, II, S. 1-6 hr.

395. *The Principalship.* I, S. 3 hr. A study of the active role of principals in Early, Middle, and Adolescent schools. Specific emphasis is placed upon the areas of effective schools, instructional leadership, special services and facilities management.

397. *Master's Degree Research or Theory.* I, II, S. 1-15 hr.

402. *Superintendency.* I, II, S. 3 hr. PR: M.A. in education administration, or equiv., or consent. Roles, relationships, behaviors, and competencies which characterize the school superintendent and staff. (Offered in Fall and Summer of even years.)

403. *Education Administration Theory.* I, II, S. 3 hr. PR: M.A. in education administration, or equiv., or consent. Interdisciplinary study of the major concepts of education administration theory and the application to educational settings.

404. *Public Education Finance.* I, II, S. 3 hr. PR: M.A. in education administration, or equiv., or consent. Basic concepts. (Offered in Spring of even years.)

405. *Administration of Educational Facilities.* I, II, S. 3 hr. PR: M.A. in education administration, or equiv., or consent. The planning, evaluation, and management of current and future school facilities. (Offered in Spring of even years.)

406. *Public Education and the Law.* S. 3 hr. PR: M.A. in education administration or equiv., or consent. Legal permissives and limitations involved in setting policy for organization of, and administration of public schools. (Offered in Fall and Summer of even years.)

407. *Collective Bargaining in Public Education.* II. 3 hr. PR: M.A. in education administration, or equiv., or consent. This course is designed to inform school administrators about the concepts and principles of negotiating and implementing collective bargaining agreements. (Offered in Spring of even years.)

408. *Organizational Analysis.* I. 3 hr. PR: M.A. in education administration, or equiv., or consent. An examination of alternative means for the analysis of organizational structures, interrelationships, and functions. A field analysis is required.

409. *Politics of Education*. II. 3 hr. PR: M.A. in education administration, or equiv., or consent. An examination of the internal political nature of school systems, and of the external influence of legislative, judicial, and administrative bodies, and interest groups.

410. *Advanced Supervision*. 3 hr. PR: Consent. Exploring theories, research and practice of preservice and inservice instructional supervision in the classrooms of novice and mature teachers. (Also listed as C & I 410.)

456. *Administration of Academic Affairs*. 3 hr. PR: Consent. Management, leadership, and administrative roles of academic affairs offices in colleges and universities including academic personnel, program definition, research and teaching issues, and other functions of academic oversight.

457. *Governance of Higher Education*. 3 hr. PR: Consent. Formulation and implementation of state master plans and the roles of state governing bodies in public and private institutions.

458. *College Business Management*. I. 3 hr. PR: M.A. in education administration, or equiv., or consent. Covers knowledge of such areas as budgeting, grants and contracts preparation and administration, formula funding, management information systems, purchasing procedures and practices, and zero base budgeting. (Offered in Fall of odd years.)

459. *Adult and Continuing Education*. I, II, S. 3 hr. Principles, concepts, and processes involved in programming for adults in a community setting. Nature of adult learning, subject matter, and learning environment. (Offered in Summer of even years.)

460. *Development of Administration in American Higher Education*. I, II, S. 3 hr. The administrative development of American higher education from 1636 to the present, including internal trends and external forces.

461. *Higher Education Administration*. I, II, S. 3 hr. Organization and administration of higher education institutions.

462. *Higher Education Law*. I, II, S. 3 hr. Critical legal issues of higher education—public and private—using a case study approach.

463. *Higher Education Finance*. I, II, S. 3 hr. Financial concerns in higher education with emphasis on taxation and legislative actions, sources of income, budgeting, and cost analysis. (Offered in Fall of even years.)

465. *Institutional Research and Planning*. I, II, S. 3 hr. Accumulation, analysis, and interpretation of data relevant to decision making and the allocation of institutional resources. (Offered in Spring of even years.)

466. *The College Student*. I, II, S. 3 hr. Review of research and literature on college students from freshman through graduate school. Emphasis on student subcultural patterns. (Offered in Spring of odd years.)

467. *Higher Education Collective Bargaining*. I, II, S. 3 hr. The process and content of collective bargaining in higher education and its impact on institutional governance and academic jurisdictions. (Offered in Spring of even years.)

468. *Community and Junior Colleges*. I, II, S. 3 hr. Development, role, functions, organization, and curriculum of community and junior colleges in the United States, with special emphasis on West Virginia.

469. *Education Administration Internship*. 3-6 hr. (May be repeated for credit.) PR: Consent. Practical experiences in the administration of an organizational unit under the supervision of an administrator within the unit.

470. Principal's Planned Field-Based Experience. I, II. 3 hr. PR: Three years of successful experience as a teacher and have a position as principal or assistant principal. Consists of problem-solving techniques and seminar activities as applied to explicit problems in the professional environment. (Required for permanent certification as a principal.)

471. Supervisor's Planned Field-Based Experience. I, II. 3 hr. PR: Three years of teaching experience, 15 hours completed in a master's degree program, and be employed full-time as a supervisor. Consists of problem-solving techniques and seminar activities as applied to explicit problems in the professional environment. (Required for permanent certification as a supervisor.)

472. Superintendent's Planned Field-Based Experience. I, II. 3 hr. PR: Five years of successful experience as a teacher or supervisor, and employed as a superintendent or assistant superintendent. Consists of problem-solving techniques and seminar activities as applied to explicit problems in the professional environment. (Required for permanent certification as a superintendent.)

480. Seminar. I, II, S. 1-6 hr. PR: Consent.

485. Special Topics. I, II, S. 1-6 hr. PR: Consent.

491. Advanced Study. I, II, S. 1-6 hr. PR: Consent. Advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

497. Research. I, II, S. 1-15 hr. PR: Consent.

EDUCATIONAL PSYCHOLOGY

Anne H. Nardi, Department Chairperson
608 Allen Hall

Degree Offered: Master of Arts, Area of Emphasis for Doctor of Education
Graduate Faculty: Members B. Bailey, Baker, Bonk, Fraley, Grasso, Hursh, McAvoy, A. H. Nardi, Reinhard, M. Tseng, E. A. Vargas, J. S. Vargas, and Walls. Associate Members Paterson and Stead.

The educational psychology program in the College of Human Resources and Education offers opportunities for graduate study and research leading to the master of arts. Professional preparation focuses on learning and development, instruction and research. Accordingly, students are expected to achieve competencies in these areas.

Programs are planned jointly by the student, the student's adviser, and the student's committee to meet particular career needs. Minor fields of study are also planned for each student as appropriate. In addition to the general requirements of the University and the College of Human Resources and Education, the department requires a core of courses and supporting competencies of all graduate students.

Educational psychologists function in a variety of settings. The program prepares and places competent educational psychologists in educational settings at all levels, such as educational agencies at local, state, and federal levels; public and private human service centers; medical centers; and business and industrial settings.

Admission Requirements

All applicants must comply with the general requirements of the University and the College of Human Resources and Education. The applicant must have an undergraduate degree from an accredited institution and must submit official transcripts of the undergraduate work, the official scores for

either the Graduate Record Examination (GRE) or the Miller Analogies Test (MAT), a 500-word, written goal statement, a personal vita, and three letters of reference.

Master of Arts Requirements

Each student is expected to complete the following core of courses as part of the master's plan of studies:

- Ed.P. 300—Advanced Educational Psychology
- Ed.P. 311—Statistical Methods 1
- Ed.P. 320—Introduction to Research
- Ed.P. 330—Foundations of Educational Measurement

The option requires a minimum of 30 hours of course work including the completion and successful defense of a thesis or the completion of 30 hours of course work including the completion of a problem. Those students who plan to pursue a doctorate are required to take the thesis option.

Doctor of Education Option

The credentials for all applicants are screened by a three member admissions committee of the department. The criteria used as guidelines for evaluating applicants are:

1. Total GRE scores of 1,100 or higher or MAT score of 55 or higher; international students from a country in which English is not the native language must have a TOEFL score of at least 550 and a combined total score of at least 1000 on the GRE verbal and the TOEFL.
2. An undergraduate GPA of at least 3.0.
3. A graduate GPA of 3.25 or higher for graduate work completed to date.
4. The extent to which the applicant's goals and objectives may be accomplished if admitted to the program.
5. Favorable recommendations and appropriate background experiences.

To remain in good standing, a student must have an average grade of B or better for all courses in the program and make satisfactory progress toward the completion of the program competencies (as described in the following section).

Option Requirements

The doctor of education option requires a minimum of 72 hours of graduate credit beyond a bachelor's degree or 42 hours beyond a master's degree. In addition, completion of a core of required courses, fulfillment of competency requirements, and an approved dissertation are mandatory.

Each student is expected to complete the following core courses as part of the doctoral plan of studies:

- Ed.P. 301—Introductory Behavior Analysis: Human Resources
- Ed.P. 419—Research in Education (PR: Ed.P. 311)
- Ed.P. 440—Human Development and Behavior
- Ed.P. 451—Principles of Instruction

The student is also expected to enroll in a doctoral seminar, Ed.P. 496, for two semesters for in-depth coverage of specialized content issues in educational psychology.

There are three competency areas in the program: learning and development, instruction, and research. Students are expected to fulfill the program competency requirements by meeting the goals and objectives specified for the program. The learning and development competency product will take the

form of a theoretical paper, the instruction competency product will be a course or other type of instructional sequence of comparable magnitude, and the research competency product will be a data-based research paper of publishable quality.

Application Information

Inquiries should be addressed to the Chairperson of the Department of Educational Psychology, Allen Hall, College of Human Resources and Education, West Virginia University, P.O. Box 6122, Morgantown, WV 26505-6122.

Educational Psychology (Ed. P.)

231. *Sampling Methods*. I. 3 hr. PR: An introductory course in statistics. Methods of sampling from finite and infinite populations, choice of sampling unit, sample survey design, estimation of confidence limits and optimum sample size, and single- and multi-stage sampling procedures. (Also listed as Stat. 231.)

260. *Media and Microcomputers in Instruction*. I, II, S. 3 hr. The effective operation and educational uses of educational media including microcomputers. Hands-on experience with equipment, and in designing materials for an instructional unit incorporating media and/or microcomputers.

269. *Behavioral Technology for Education*. I, II, S. 3 hr. PR: Ed. P. 105 recommended. Behavioral science applied to instructional systems. Complex systems; feedback loops; measuring relevant variables, collecting data. Applying schedules of reinforcement. Effective stimulus control for students and administrators. Relationship between system and institution. Behavioral ethics.

300. *Advanced Educational Psychology*. I, II, S. 3 hr. Design for beginning graduate students. Psychological principles of learning and development as they relate to processes of classroom instruction.

301. *Introductory Behavior Analysis: Human Resources*. I, II, S. 3 hr. Introduction to behavior analysis in education and human resources. Basic practice in measuring and shaping human behavior. A comprehensive examination of relationships among human organisms, environment, and behavior.

311. *Statistical Methods 1*. I, II, S. 3 hr. PR: Math. 3. Basic concepts of statistical models, distributions, probability, random, variables, tests of hypotheses, confidence, intervals, regressions, correlation, transformation, F and X_q distributions, analysis of variance and sample size.

312. *Statistical Methods 2*. I, II, S. 3 hr. PR: Stat. 311. Extension of basic concepts of statistical models, design of experiments, multiway classification models, factorials, split plot design, simple covariance, orthogonal comparisons, multiple linear and nonlinear regression and correlation analysis, chi-square and nonparametric statistics.

320. *Introduction to Research*. I, II, S. 3 hr. PR: Ed. P. 311. Basic concepts, strategies, methodologies, designs, and procedures of research in education. Major emphasis on integrating research designs, measurements, and statistics for initiating research projects, collecting and analyzing data, and interpreting and reporting findings.

321. *Design of Experiments*. I, II, S. 3 hr. PR: Ed. P. 320 or 330 or equiv. Elements of experimental design and their implications for (including computer graph) setting up research, sampling methods, recording and display of data, interpretation of data, design and analysis of experiments over time, trend analysis statistics appropriate in individual and group designs.

330. *Foundations of Educational Measurement*. I, II, S. 3 hr. An examination and application of norm-referenced and criterion-referenced principles and procedures to the measurement and prediction of pupil performance.

333. *Nonparametric Statistics*. II. 3 hr. PR: Introductory course in statistics. Single sample tests; for related samples, two independent samples, K related samples, K independent samples, and measures of correlation.

341. *Multivariate Methods 1*. I. 3 hr. PR: Stat. 311 or equiv. Basic matrix operations, multiple regression analysis, discriminant analysis for two groups, multivariate analysis of variance for one- and two-way designs, and analysis of covariance involving multiple covariates. Applying SAS Procedure Matrix for data analyses.

342. *Multivariate Methods 2*. II. 3 hr. PR: Stat. 311 or equiv. Matrix operations, multivariate multiple regression analysis, canonical correlation analysis, discriminant analysis for multiple groups, qualitative discriminant analysis applying Bayes' theorem, principal component analysis, and fundamentals of common factor analysis. Data analyses with SAS Procedure Matrix.

343. *Statistical Analysis in Education*. I, II, S. 3 hr. PR: Ed. P. 330 or consent. Review measures of central tendency, percentiles, and correlation. Emphasis placed on correlation, regression, testing hypothesis, non-parametric tests, and other measures in analysis and inference.

350. *Applied Behavior Analysis*. I. 3 hr. PR: Ed. P. 301 or equiv. Application of reinforcement theory as an instructional technique in changing human behavior. Analysis of problems in terms of behavior and the design of instruction and treatment programs to produce desired change.

359. *Conceptual Foundations of Behavior Analysis*. I. 3 hr. Comprehensive introduction to the basic science of human behavior and its philosophy. Provides a conceptual framework for a variety of applied fields.

360. *Behavior Analysis: Teaching/Training Systems*. II. 3 hr. PR: Consent. Analyzing behavior of teachers/trainers; behavior analytic designs for teaching arrangements that respect scientific principles of human behavior from perspectives of both teachers and students; comparative analysis of teaching systems; cybernetic teaching; practice designing instruction.

361. *Cybernetic Systems of Individualized Instruction*. II. 3 hr. PR: Ed.P. 360. Advanced analysis of behavioral education systems. Principles of designing and developing behavioral teaching systems. Applied design. Instructional system projects will be undertaken either individually or in teams.

362. *Instructional Systems—Administration and Management*. II, S. 3 hr. PR: Ed. P. 361 or consent. The conduct of instructional operations within instructional systems; the administration and management of organizational arrangements to support system approaches to instruction.

364. *Precision Teaching*. II. 3 hr. Design and adapt materials for precision teaching for educational decisions and for research.

370. *Programmatic Research*. II. (Alternate Years.) 3 hr. How to conduct programmatic research: how to phrase the question, select a measurement procedure, collect data, and use data to make experimental decisions as work progresses.

371. *Behavioral Measurement*. I, II, (Alternate Years.) 3 hr. Analysis of the behavior of measuring. Measurements of the behavior of individuals and in groups in applied settings. The role of measures in contingencies governing the behavior of subjects and practitioner. Techniques for graphic analysis.

385. *Practicum*. I, II, S. 1-12 hr. PR: Consent.

391. *Problems in Advanced Educational Psychology*. I, II, S. 1-6 hr.

397. *Master's Degree Research or Theory*. I, II, S. 1-15 hr.

400. *Verbal Behavior 1*. I. 3 hr. PR: Ed. P. 350 or consent. Behavioral analysis of complex verbal behavior in person to person contacts in text materials, and in instructional systems.

401. *Verbal Behavior 2*. II. 3 hr. PR: Ed. P. 400 or consent. Advanced concepts in the analysis of verbal behavior. Review of current theoretical and experimental literature.

420. *Seminar in Educational Research*. I, II, S. 3 hr. PR: Ed. P. 311 and consent. Identification of research problems in education, consideration of alternative designs and methods of investigations, and development of a research proposal at the advanced graduate level.

423. *Designing Single Case/Group Research*. I. 3 hr. Strategies and tactics for observation, measurement, and experimental investigation of functional relationships between the behavior of individuals and their environment are presented as a means for understanding what controls human behavior.

440. *Human Development and Behavior*. I, II, S. 3 hr. Psychological theories of human development. Contemporary theories analyzed and compared with emphasis on their implication for classroom behavior and the educational process.

450. *Psychological Foundations of Learning*. I, II, S. 3 hr. Psychological and philosophical foundations of major learning theories and their implications for instructional procedures.

451. *Principles of Instruction*. I, II, S. 3 hr. PR: Consent. Basic principles of teaching-learning process implied in major learning theories; study of factors in learning, variables in instructional program, and principles of instructional design.

452. *Stimulus Conditions in Learning*. II. 3 hr. Stimulus conditions and stimulus control in human association learning, discrimination learning, sequence learning, concept learning, and problem solving.

480. *Seminar in Educational Psychology*. I, II, S. 1-6 hr. PR: Consent.

481. *Special Topics in Educational Psychology*. I, II, S. 1-6 hr. PR: Consent.

490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility. Provides a supervised experience for graduate students in a teaching situation.

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced areas of educational psychology.

496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. Designed to permit graduate students an opportunity to present research to the assembled faculty and the graduate student body.

497. *Research*. I, II, S. 1-15 hr. PR: Consent. Dissertation.

498. *Thesis*. I, II, S. 2-4 hr. PR: Consent.

ELECTRICAL AND COMPUTER ENGINEERING

Ronald L. Klein, Chairperson of the Department
823 Engineering Sciences Building

Degrees Offered: Master of Science in Electrical Engineering
Electrical Engineering and Computer Engineering Areas of Emphasis available for:
Master of Science in Engineering, Doctor of Philosophy

Graduate Faculty: Members Alajajian, Choudhry, Cooley, Feliachi, Heidary, Jerabek, Joseph, Klein, Klinkhachorn, Kumar, McConnell, Middleton, Noore, Nutter, and Sims.

The Department of Electrical and Computer Engineering, with 16 faculty members, 250 undergraduate students, and over 60 graduate students, offers excellent graduate areas of emphasis in:

1. Digital systems design, including microprocessor applications, advanced computer architecture, and computer engineering.
2. Control systems, including classical and modern theory and applications.
3. Signal processing, including digital filtering and communications.
4. Electric power systems, including stability, transients, real time control, protection and steady state analysis.
5. Electromagnetics, including antennas and microwave systems.
6. Electronics, including circuit analysis, integrated circuit devices, and VLSI design.

The Department of Electrical and Computer Engineering is authorized to admit students to the degree programs of the Master of Science in Electrical Engineering (M.S.E.E.) and the Master of Science in Engineering (M.S.E.). It also participates in the College of Engineering interdisciplinary Ph.D. degree program, offering the Ph.D. with specialization in electrical engineering and in computer engineering. M.S. graduate students must comply with the rules for Master's degrees as set forth in the *Guidelines for Masters Degree Programs Offered in the College of Engineering*. Ph.D. students must comply with the rule set forth in the brochure. *The College of Engineering Doctor of Philosophy Program Guidelines*.

Approximately seven M.S. and two Ph.D. degrees are awarded each year. These graduates are in great demand by industry.

Digital Systems Design

Digital computer and microprocessor systems design is the most technologically intensive component in the electrical and computer engineering curriculum. Integrated circuits with increasing capabilities are rapidly being developed. In turn, the demand for electrical engineers and computer engineers with strong educational backgrounds is rising very rapidly. The electrical and computer engineering curriculum offers a large selection of both required and elective graduate courses in computer systems. These cover such topics as digital logic, microprocessor applications, interfacing, computer architecture, computer arithmetic, computer networks, performance evaluation, VLSI testing techniques, and fault tolerant computing. In addition, the department cooperates closely with the University's computer science faculty so that E.E. graduate students are able to include computer science courses in real-time operating systems, data structures, digital communication software,

*The department is authorized to award the B.S.Cp.E. degree (Computer Engineering). At this time the department is planning for the M.S.Cp.E. degree; however, it has not yet been authorized. The Ph.D. is awarded by the College of Engineering and is available with emphasis in electrical or computer engineering.

artificial intelligence, and interactive graphics in their program. A number of research projects utilizing computers and/or design of computer systems have been completed or are being completed by faculty and graduate students in the department. Some examples are real-time monitoring of environmental conditions in a coal mine using digital communications and a minicomputer, a distributed microprocessor monitoring system, a study of the methodology whereby reliability of an environmental monitoring system can be established, and a knowledge based decision support system for mining.

The Department of Electrical and Computer Engineering operates and maintains a number of dedicated computers running the UNIX operating system. These computers support both the instructional and research activities of the department. These systems are a VAX 11/780, several PDP 11's, a variety of stand-alone microcomputers, and SUN workstations. In addition the department is linked to two College of Engineering computers, a Harris HCX-9 and a VAX 11/785, and to the extensive computing facilities of WVNET by means of an ETHERNET system. Through this link and a 1.5 megabit microwave link to the computers in the Department of Computer Science, the department has access to several additional VAX systems and to many computing networks via INTERNET as well as to the Pittsburgh Supercomputing Center.

Control Systems

The study of control systems is a highly mathematical topic with a broad range of applications. This subject area interests those who wish to apply technology to control dynamical systems. Signals from sensors, usually processed by a computer, are necessary for proper control of a system. Consequently, the student interested in control systems will also take course work in computer systems and in digital signal processing.

The graduate curriculum in control and systems engineering consists of courses in both classical and modern control theory and applications. These include modeling techniques in both the frequency and time domains for continuous and discrete time systems, optimal control, digital control, and estimation theory. Classical techniques for control systems and design tools such as root locus, Nyquist, and Bode methods for linear time-variant systems are also included. Also offered are courses in adaptive control, large scale systems, and stochastic control.

Currently, the faculty in the control area are actively involved in a number of research areas. These include both sponsored and unsponsored research activities with some projects related to a specific application and some being of a theoretical nature having a wide range of applications. Research projects in control and systems engineering include the following:

1. Research in large scale systems. The primary emphasis is on designing fast estimate algorithms for distributed systems.
2. Analysis and design of tracking systems. Signal processing algorithms are designed to improve the position estimates provided by a tracking radar. Kalman filtering is the principal algorithm used in this study.
3. Reduced order systems design. The optimization of reduced-order models, filters, and controllers is considered in this investigation. Optimal control theory is applied to linear stochastic models to obtain designs having limited complexity but excellent performance.
4. Deconvolution methods for seismic signal processing. Methods of deconvolution for nonstationary seismic signals are investigated. These include modified Wiener and Kalman filtering techniques.

5. Fast algorithm design. Minimum mean-square-error signal processing algorithms are developed subject to a constraint on the allowable number of multiplications per iteration.

6. Modeling of power-system load dynamics. The daily variations in an electric utility's power demand are quite significant. For operational control of generation to meet user's demands, a dynamic model of the variations is useful. When developed, this model can be used to forecast future demand values and schedule power generation accordingly.

The faculty in the control area has research sponsored by the U.S. Office of Naval Research, the National Science Foundation, the state of West Virginia, and private organizations. In addition to the topics listed above, the control group is beginning to be involved with control research in the robotics and flexible manufacturing area.

Signal Processing and Communications

Signal processing and communications is an area of emphasis and strength in the department. Faculty and graduate students conduct basic and applied research covering a wide range of topics. Signal detection, and circuit and system designs for processing these signals, particularly those using digital hardware, have experienced dramatic evolution recently. Important areas of application of research results obtained in the department include: medical diagnosis, geophysical prospecting, speech and speaker recognition, echo cancellation in satellite communications, and noise cancellation in acoustic systems. The graduate program includes several courses to support ongoing research in adaptive systems, fundamentals of digital signal processing (DSP), applications of DSP, and advanced topics in DSP. Also the department has a well established and equipped DSP research laboratory. Specific examples of research in progress are: speech modeling and compression, adaptive noise cancellation, and three-dimensional tomographic imaging.

In the speech modeling area, several new techniques for representing speech signals that promise more accurate representation without increasing the data rate are under investigation. The noise cancellation research addresses the generation of optimum algorithms as well as their time and frequency domain implementations. Hardware realizations of these algorithms using DSP microprocessors for acoustic noise cancellation are in progress. The three-dimensional tomographic research under way explores nondestructive methods which are attractive ecologically, technically, and economically and which identify the properties to characterize underground resources.

Electrical communications have made dramatic impacts on human life. The department offers courses in the basics of communications as well as more contemporary new developments, such as digital communications, pulse code modulation, frequency shift keying, and spread spectrum systems. Examples of research projects in communications engineering being conducted by faculty and graduate students are: development of an improved communication system for an urban transportation system, electronically programmable active filters, and the use of spread spectrum techniques.

Electric Power Systems

Electric power systems historically have been an area of emphasis in the electrical engineering curriculum, and the graduate program in power systems at WVU is quite mature. Five graduate courses are offered in this area on a regular basis. In addition, there are four senior elective/graduate courses

on such subjects as distribution, industrial power systems, power electronics, and advanced power systems analysis. Outside research funding for work on reliability, grounding, transmission, electric transportation, and optimal design provides excellent support for both graduate students and faculty research. Extensive cooperation with industry also provides ample opportunity for field study.

Electromagnetics, Antennas, and Microwave Systems

Electromagnetics encompasses the generation, radiation, propagation, scattering, interaction with matter, and reception of electromagnetic energy from radio to optical frequencies. The department offers senior/graduate courses in antennas, microwaves, and radar. In addition, graduate-level courses in advanced electromagnetics, wave propagation, antenna theory, and guided waves are offered on a regular basis. Research projects have been in the areas of three-dimensional scattering, Fourier transform inversion methods, scattering from dielectrics, coupling to transmission lines, reflection from imperfect ground, geometric theory of diffraction, and numerical techniques.

Electronics, Circuit Analysis, Integrated Circuits and VLSI

Electronics, circuit analysis, IC's and VLSI are all areas of emphasis in the department. Courses are offered in advanced circuit analysis, integrated circuits (both analog and digital), radio frequency electronics, noise and grounding and power electronics. Recent research efforts in electronics include the development of electronic systems for monitoring and control with applications in mining and agriculture, RF high voltage electronics, and power electronics. Work in power electronics applications includes the development of an arc reduction controller for mine transportation systems and the design of a power system stabilizer.

A major new thrust in the department is in the area of VLSI systems design. Circuit fundamentals, device physics, and system principles are emphasized along with teaching the fundamentals of CAD/CAE tools. Structured design and testing is also an active area of research.

Master of Science in Electrical Engineering (M.S.E.E.)

Master of Science in Engineering (M.S.E.)

Admission Requirements

1. An applicant must have an excellent record in previous college work. To be admitted as a regular graduate student in electrical and computer engineering, a cumulative grade-point average of 3.0 (of 4.0), or its equivalent, is required.

2. An applicant who cannot meet condition 1 may be considered for admission in one of several conditional categories (See "Classification of Graduate Students," Part 2.)

3. Applicants who are not WVU graduates must submit scores of the Aptitude Test of the Graduate Record Examination.

4. All international applicants whose native language is not English must submit Test of English as a Foreign Language (TOEFL) scores. A minimum of 550 is required for admission.

Course Requirements. All M.S. degree candidates will be required to meet the following minimum requirements:

1. E.E. 325 and at least one course selected from the following: E.E. 315, 333, 340, 350 or 357, 364, and Cp.E. 370—six hours minimum.
2. Selected courses offered outside the Department of Electrical and Computer Engineering to provide analytical techniques supporting the student's graduate program. (For example: mathematics, physics, computer science, etc.)—six hours minimum.

Each graduate student will be required to make an oral presentation of his/her research program to a graduate seminar near the conclusion of the student's research but before scheduling the final examination.

Entrance Interview. All students beginning graduate study in the department will be given an entrance interview. The interview determines if a student needs any course work in order to pursue a graduate degree program and aids the faculty in advising the student. As a result of the interview, the student and the committee will prepare a mutually acceptable preliminary plan of study.

Students with deficiencies in their undergraduate programs may be required to take some engineering or other courses as prerequisites for graduate courses. These deficiencies are usually noted as a condition for admission. However, they may also be specified as a result of the entrance interview.

Qualifying Examination. Each student pursuing graduate study leading to the M.S. or the Ph.D. degree must pass a written qualifying examination at the level of competence appropriate to the degree sought. Details regarding this examination are available from the departmental graduate academic adviser.

Thesis. Normally, a thesis is required of all M.S. candidates in electrical engineering. Approval by the Advisory and Examining Committee is necessary before the thesis will be accepted. The thesis must be presented in a form that conforms to general requirements of the University.

Final Examination. Each candidate for an M.S. degree shall pass a final examination administered by the student's Advisory and Examining Committee. This examination is oral and shall cover the defense of the thesis, or report, when applicable.

Students may be admitted to the M.S.E.E. program if they hold a baccalaureate degree in electrical engineering or its equivalent. Students who lack this requirement may either make up the necessary undergraduate course work or may apply for admission to the M.S.E. program with emphasis in electrical engineering.

The M.S.E. program is available to students who are interested in graduate work in electrical engineering, but who hold a baccalaureate degree from another field of engineering or from another discipline. Students with a baccalaureate degree from another field of engineering, or from one of the sciences, should contact the department for further information. In general, a student in the M.S.E. program will be expected to either complete certain undergraduate prerequisite courses or attain equivalent competence but will not be required to complete all of the requirements equivalent to the B.S.E.E. degree. However, all graduate students will be required to meet the prerequisites for each course taken for credit.

Doctor of Philosophy (Ph.D.)

Students interested in the graduate program in electrical and computer engineering and who wish to pursue the Ph.D. degree should contact the department for information about the interdisciplinary Ph.D. program in engineering. While it is possible for a student with only a B.S. degree to enroll directly in the Ph.D. program, it is usually advisable for the student to earn an M.S. degree first. The reason for this is the fact that a student's performance in an M.S. degree program with thesis provides insight into the student's research ability whereas most B.S. degree programs do not. Students in the Ph.D. program must comply with the regulations set forth in the College of Engineering brochure describing the doctor of philosophy in engineering.

A student already in possession of a master's degree may apply directly to the Ph.D. program. Admission requirements are substantially the same as for the M.S.E.E. program.

A Typical Ph.D. Degree Program

A typical Ph.D. program will take between three and four years beyond the baccalaureate degree. The courses chosen for a student's program are selected to develop the student's expertise in his/her area of interest and to strengthen knowledge of other areas that will support the student's research endeavors. A possible outline for a Ph.D. program:

First Year—M.S. degree

Second Year—

- (a) An approved plan of study consisting mainly of courses in the 300 and 400 series.
- (b) A pass in the qualifying examination for a Ph.D.
- (c) Admission to candidacy for the Ph.D. degree.
 - (1) Passes on written and oral comprehensive examinations.
 - (2) Successful defense of research proposal.
 - (3) Completion of all program requirements set by the student's advisory and examining committee.

Third Year—

- (a) Completion of research and the dissertation.
- (b) Dissertation defense in the final examination.

Research work for the doctoral dissertation is expected to represent a significant contribution to engineering. It may entail a fundamental investigation into a specialized area or a broad and comprehensive system analysis or design.

Computer Engineering (Cp.E.)

272. *Introduction to Computer Architecture.* 3 hr. PR: Cp.E. 71. Basic digital systems and computer architecture. Definition of information storage concepts, central processor designs, and input/output concepts. Content addressable memories, microprogrammed control, addressing techniques, interrupts, and cycle stealing. 3 hr. rec.

274. *Introduction to Microprocessor-Based Design.* 3 hr. PR: E.E. 156, 157, Cp.E. 272 or consent. Coreq.: Cp.E. 276. Microprocessor terminology and system design. A systems approach is taken to individual student designs of microprocessor systems. A "hands-on" electronic development approach is taken using state-of-the-art computer technology. 3 hr. rec.

276. *Microprocessor Laboratory.* 1 hr. Coreq.: Cp.E. 274. Laboratory to accompany Cp.E. 274. A microprocessor-based single board computer (SBC) is designed and built using wire wrap techniques. Once operational, the SBC is programmed in assembly language. A semester project is required. 2 hr. lab.

291. *Special Topics in Computer Engineering.* I, II, S. 1-3 hr. PR: Consent. Investigation of topics not covered in regularly scheduled courses.

370. *Switching Circuit Theory 1.* 3 hr. PR: Cp.E. 71 or equiv. Course presumes an understanding of the elements of Boolean or switching algebra. Study of both combinational and sequential switching circuits with emphasis on sequential networks. Advanced manual design and computer-aided design techniques for single and multiple output combinational circuits. Analysis and design of sequential circuits. Detection and prevention of undesired transient outputs. 3 hr. rec.

372. *Advanced Computer Architecture.* 3 hr. PR: Cp.E. 71 and 272 or consent. Formal tools for designing large digital systems are introduced; formal descriptive algebras such as ISP, PMS, AHPL, CDL, and others. An in-depth study of computer system designs including instruction design and data path design. 3 hr. rec.

373. *Design of Computer Arithmetic Circuits.* 3 hr. PR: Cp.E. 71 or equiv. Study of logic networks usable in performing binary arithmetic. Emphasis is on design of high-speed, parallel arithmetic units using binary numbers. Consideration of systems for representation of negative numbers. Available arithmetic subsystems are studied. 3 hr. rec.

391. *Advanced Topics.* I, II, S. 1-6 hr. PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

397. *Master's Degree Research or Thesis.* I, II, S. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

471. *Switching Circuit Theory 2.* 3 hr. PR: Cp.E. 370, Math. 236, or equiv. Switching circuit theory is used to model the operations of networks of logic gates and flip-flops. Networks of this type are one form of discrete parameter systems. Studies the use of linear sequential machine as a means of modeling the general class of discrete parameter information systems. Systems approach and the techniques of abstract algebra used throughout. 3 hr. rec.

472. *Digital Systems Design 2.* 3 hr. PR: Cp.E. 372 or consent. Students will design a specific digital system, i.e., CPU control, interrupt structure, memory, or input/output system. They will design and test a project oriented toward one specific objective.

491. *Advanced Study.* 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

497. *Research.* 1-15 hr.

Electrical Engineering (E.E.)

208. *Power Electronics.* 3 hr. PR: E.E. 130 and E.E. 158, 159 (concurrently) or consent. Application of power semiconductor components and devices to power systems problems: power control, conditioning, processing, and switching. Course supplemented by laboratory problems. 3 hr. rec.

216. *Fundamentals of Control Systems.* 3 hr. PR: E.E. 124, 127. Introduction to classical and modern control; signal flow graphs; state-variable characterization; time-domain, root locus, and frequency techniques; stability criteria. 3 hr. rec.

230. *Electrical Power Distribution Systems.* 3 hr. PR: E.E. 131, 136 or consent. General considerations; load characteristics; subtransmission and distribution substations; primary and secondary distribution; secondary network systems; distribution transformers; voltage regulation and application of capacitors; voltage fluctuations; protective device coordination. 3 hr. rec.

231. *Power Systems Analysis.* 3 hr. PR: E.E. 131, 136 or consent. Incidence and network matrices, Y-Bus, symmetrical and unsymmetrical faults, load-flow and economic dispatch, MW-frequency and MVAR-voltage control. The power system simulator will be used for demonstrations. 3 hr. rec.

244. *Introduction to Antennas and Radiating Systems.* 3 hr. PR: E.E. 141 or consent. Fundamentals, parameters, radiation integrals, linear antennas, far-field approximations, loop antennas, arrays and continuous distributions, broadband dipoles and matching techniques, broadband antennas, frequency independent antennas, and aperture antennas. 3 hr. rec.

245. *Microwave Circuits and Devices.* 3 hr. PR: E.E. 141. UHF transmission line theory, impedance matching techniques and charts, general circuit theory of one port and multiports for waveguiding systems, impedance and scattering matrices, waveguide circuit elements, microwave energy sources. Course will be supplemented by laboratory problems. 3 hr. rec.

246. *Radar and RF Systems Engineering.* 3 hr. PR: E.E. 126, 141, 156, 157, 158, 159. An introduction to radar system fundamentals and techniques, including a discussion of modulation and detection theory, RF amplifiers, mixers, antennas, and propagation effects. Application of probability and statistics to signal processing and detection in noise. 3 hr. rec.

248. *Fiber Optic Communications.* 3 hr. PR: E.E. 126, 141, 151. Fundamentals of optics and light wave propagation, guided wave propagation and optical wave guides, light sources and light detectors, couplers, connections, and fiber networks, modulation, noise, and detection in communication systems. 3 hr. rec.

251. *Noise and Grounding of Electronic Systems.* 1 hr. PR: E.E. 158, 159 or consent. Analysis of extrinsic and intrinsic noise in electronic circuits. Design techniques to reduce or eliminate noise. 1 hr. rec.

252. *Operational Amplifier Applications.* 3 hr. PR: E.E. 158, 159. Linear integrated circuit building blocks applied to such functions as amplification, controlled frequency response, analog-digital conversion, sampling, and waveform generation. 2 hr. rec., 3 hr. lab.

257. *Transistor Circuits.* 3 hr. PR: E.E. 158, 159 or equiv. Analysis and design of subcircuits used in analog integrated circuit modules. Transistor models, low-frequency response of multistage amplifiers, current sources, output stages and active loads. 3 hr. rec.

259. *Solid State RF Engineering.* 3 hr. PR: E.E. 126, 141, 156, 158 or corequisite. Analysis and design of electronic circuitry for RF telecommunications systems. Treatment of electrical noise, RF amplifiers, oscillators and mixers. Applications of AM/FM/TV. Receiver and transmitter technology for HF/VHF/UHF and satellite communication. 3 hr. rec.

264. *Introduction to Communication Systems.* 3 hr. PR: E.E. 126. Introduction to the first principles of communication system design. Analysis and comparison of standard analog and pulse modulation techniques relative to band-width, noise, threshold, and hardware constraints. Communication systems are treated as opposed to individual circuits and components of the system. 3 hr. rec.

268. *Digital Signal Processing Fundamentals.* 3 hr. PR: E.E. 126, 127, 156, 157. Theories, techniques, and procedure used in analysis, design, and implementation of digital and sampled data filters. Algorithms and computer programming for software realization. Digital and sampled data realizations, switched capacitor and charge-coupled device IC's. 3 hr. rec.

281. *Biomedical Electrical Measurements.* 2 hr. PR: E.E. 158 and 159 or consent. Biomedical instrumentation for human subjects. Origin and characteristics of biological and electrical signals. Instrument design requirements and detailed analysis of cardiac support and intensive-care monitoring equipment. 2 hr. rec.

291. *Special Topics in Electrical Engineering. I, II, S.* 1-3 hr. PR: Consent. Investigation of topics not covered in regularly scheduled courses.

314. *Stochastic Systems Theory.* 3 hr. PR: Consent. Probability distribution and density functions. Bayes rule and conditional probability. Stochastic process and linear systems. Gauss-Markov Process. Optimal linear estimation. Introduction to Wiener and Kalman filtering. Decision theory fundamentals. 3 hr. rec.

315. *State Variable Analysis of Systems.* 3 hr. PR: Consent. Matrix theory and linear transformations as applied to linear control systems. The state-space on time-domain study of stability, controllability, observability, etc. 3 hr. rec.

316. *Optimal Control.* 3 hr. PR: Consent. Methods of direct synthesis and optimization of feedback systems; Wiener theory; Pontryagin's maximum principle; dynamic programming; adaptive feedback systems. 3 hr. rec.

317. *Introduction to Digital Control.* 3 hr. PR: E.E. 216 or equiv. or consent. Sampling of continuous-time signals; transform analysis; analysis of discrete-time systems. Translation of analog design. Controllability and observability; State-space design methods; and introduction to optimal control for discrete systems. 3 hr. rec.

325. *Advanced Linear Circuit Analysis.* 3 hr. PR: Consent. Systematic formulation of circuit equations. Use of operational techniques to find total solutions. Applications and characteristics of the Laplace and Fourier transforms, matrix algebra, complex variable theory and state variables are made to circuit analysis and elementary circuit synthesis. 3 hr. rec.

330. *Advanced Electrical Machinery.* 3 hr. PR: E.E. 131, 136 or consent. Theory and modeling of synchronous, induction, and direct-current machines, and their steady-state and transient analysis. 3 hr. rec.

331. *Electrical Power Systems 2.* 3 hr. PR: E.E. 231 or consent. Electrical transients on power systems including traveling waves due to lightning and switching. Principles of lightning protection. 3 hr. rec.

333. *Application of Digital Computers to Power System Analysis 1.* 3 hr. PR: E.E. 231 or consent. Incidence and network matrices; algorithms for their formulation; three-phase networks; short-circuit calculations; load-flow studies. 3 hr. rec.

334. *Power System Control and Stability.* 3 hr. PR: E.E. 131, 315. Review of stability theory, classical transient analysis, dynamical models of synchronous machines, power system stability under small and large perturbations, dynamic simulation of power systems. 3 hr. rec.

340. *Electromagnetic Fields and Guided Waves 1.* 3 hr. PR: E.E. 141 or equiv. Plane waves in dielectrics, conducting, and anisotropic media; polarization, radiation; duality; image theory; equivalence principle; Green's functions; integral equations; plane wave functions. 3 hr. rec.

344. *Advanced Antenna Theory.* 3 hr. PR: E.E. 244 or equiv. Aperture antennas; geometrical theory of diffraction; horns; reflectors and lens antennas; antenna synthesis and continuous sources; moment method; Fourier transform methods; antenna measurements. 3 hr. rec.

350. *Electronic Circuits.* 3 hr. PR: E.E. 158 and 159, or equiv. Analysis and design of electronic circuits; low-pass amplifiers, feedback, frequency response and stability of feedback amplifiers, nonlinear analog circuits. 3 hr. rec.

357. *Linear Integrated Circuits.* 3 hr. PR: E.E. 158, 159 or equiv. (Primarily for students specializing in communication and electronics.) Techniques of integrated circuit design and fabrication. Development of models descriptive of linear and nonlinear transistor operation. Design and analysis of high-frequency turned, direct-current, and differential amplifiers. 3 hr. rec.

358. *Integrated Logic Circuits.* 3 hr. PR: E.E. 156, 157 or equiv. or consent. (Intended for students specializing in digital circuits.) Techniques of integrated circuit design and fabrication. Development of transistor model for nonlinear operation. Design, analysis, and comparison of emitter-coupled direct-coupled, diode-transistor, and transistor-transistor integrated logic circuits. 3 hr. rec.

364. *Communication Theory.* 3 hr. PR: E.E. 264 or consent. Detailed study of probability theory and its use in describing random variables and stochastic processes. Emphasis on applications to problems in communication system design. 3 hr. rec.

366. *Information Theory 1.* 3 hr. PR: E.E. 364. Probability concepts; theory of discrete systems; encoding; theory of continuous systems; systems with memory; the fundamental theorem of information theory. 3 hr. rec.

391. *Advanced Topics. I, II, S.* 1-6 hr. PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

397. *Masters Degree Research or Thesis. I, II, S.* 1-15 hr. PR: Consent. Research activities leading to a thesis or problem report.

411. *Nonlinear Control System Analysis.* PR: Consent. Application of Liapunov's and Popov's methods to nonlinear control systems, together with classical techniques. 3 hr. rec.

416. *Stochastic Estimation and Control.* 3 hr. PR: E.E. 316 or consent. Techniques of optimal estimation and control for linear systems. Balanced emphasis is placed on both continuous and discrete time systems. Some advance topics of interest will be considered. 3 hr. rec.

430. *Real-Time Control of Electrical Power Systems.* 3 hr. PR: E.E. 231 or consent. Application of computers to modern control theory for reliable and economic real-time operation of integrated power systems. 3 hr. rec.

432. *Protection of Power Systems.* 3 hr. PR: E.E. 231 or consent. Principles of relay protection for faults on transmission lines and other devices. Use of overcurrent, differential distance, and pilot relaying systems. Special relay applications. Determination of short-circuit currents and voltages from system studies. 3 hr. rec.

440. *Electromagnetic Fields and Guided Waves 2.* 3 hr. PR: E.E. 340 or equiv. General theory of waveguides, cavity resonators, modes, losses, discontinuities, power considerations, scattering, perturbational and variational techniques. 3 hr. rec.

466. *Information Theory 2.* 3 hr. PR: E.E. 366. Continuation of E.E. 366. 3 hr. rec.

491. Advanced Study. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
496. Graduate Seminar. 1 hr. PR: Consent. Technical presentations by faculty members, outside speakers, and graduate students. Each student will give an oral presentation describing the student's research before the student's final examination. This will typically be a 40-minute presentation before the faculty and graduate students.
497. Research. 1-15 hr.

ELEMENTARY EDUCATION

W. Michael Reed, *Interim Chairperson of Graduate Programs*

602 Allen Hall

Degree Offered: Master of Arts

Graduate Faculty: Members Barksdale, Bower, Deay, DeCosta, Haas, Hoffman, Holtan,

Iannone, Moxley, Obenauf, Phillips, Reed, Rinehart, Saltz, P. Smith, and Thomas.

Associate Members Carline and Hobbs.

The Division of Education provides opportunities for graduate study and research leading to the degree of master of arts (M.A.) for educators and other professionals with educational responsibilities. The primary purpose of the masters program in elementary (early/middle) education is to provide increased knowledge, skill, and competence for teachers working with children in the elementary (early/middle) school setting. The graduate elementary (early/middle) teacher education program has three major areas of emphasis: general education, subject area curriculum and methods, and electives.

These emphases are planned jointly by the student, the student's adviser, and the student's committee to meet the career needs of the student. In addition to the general requirements of the University and the College of Human Resources and Education, there is a core of courses or course areas and supporting competencies required of all graduate students in the department.

The purpose of the program is to prepare master teachers who work with children from nursery through elementary school. The program provides the opportunity to specialize in early childhood, middle childhood, or a subject area. With adviser approval, electives may be selected that enhance the student's personal goals. While teacher certification is not a part of the master's program, students, through careful planning, may be able to complete some courses that are required for certification while working on a graduate degree.

For further information on admission and program requirements, write Chairperson of Graduate Programs, Division of Education, College of Human Resources and Education, 602 Allen Hall, P.O. Box 6122, Morgantown, WV 26506-6122.

Master of Arts in Elementary Education

All applicants must comply with the general requirements of the University, the College of Human Resources and Education, and the Division of Education.

			Hours
		Program A	B C
I. Required Courses			
C&I 301		3	3 3
C&I 330		3	3 3
C&I 340		3	3 3
C&I 350		3	3 3
C&I 388		0	0 3
C&I 391		0	3 0
C&I 497		6	0 0
Ed. F. 320 or 340		3	3 3
Ed. P. 320		3	3 0
Ed. P. 300 or 330		3	3 3
Rdng. 321, or 323, or 327, or 330		3	3 3
Total Required Courses		30	27 24
General Education Electives		0	3 12
(All elective courses must be approved by the adviser before enrollment.)			
Total for Master's Degree		30	30 36

Program A—Thesis required.

Program B—Research problem required.

Program C—36-semester hour course work program.

Master of Arts

Emphasis: Early Childhood Education

			Hours
		Program A	B C
I. Required Courses			
C&I 312		3	3 3
C&I 314		3	3 3
C&I 316		3	3 3
C&I 391		0	3 0
C&I 497		6	0 0
C&I 317 or Rdng. 323		3	3 3
CDFS 341		3	3 3
Ed. P. 320		3	3 0
Ed. P. 330		3	3 3
Total Required Courses		27	24 18
II. Approved Electives			
Restricted Electives in Early Childhood Education		3	3 3
Supportive Electives in Education		0	0 15
(All elective courses must be approved by the adviser before enrollment.)			
Total for Master's Degree		30	30 36

Program A—Thesis required.

Program B—Research problem required.

Program C—36-semester hour course work program.

Curriculum and Instruction (C&I)

205. *The Junior High School.* I, II, S. 2 hr. PR: Consent. Developing philosophy, program, and practices of the junior high school.

210. *Early Childhood Education 1.* I, II, S. 3 hr. PR: CDFS 216, Ed. P. 103 or 105. (A field experience with children 3-5 years of age is required.) Introduction to methods and materials in early childhood education for curriculum, instruction and program organization, development, and evaluation. The content of this course is applicable to field placement in a preschool, nursery school, day care, and/or child development center.

211. *Early Childhood Education 2.* I, II, S. 3 hr. PR: CDFS 216, Ed. P. 103 or 105. (A field of experience with children 3-5 years of age is required.) This course is designed for individuals who will be working within early childhood programs for children under 8 years of age. The various aspects of early childhood education are studied in relationship to organizational and administrative structures. This includes planning, budgeting, staffing, supervising, and evaluating comprehensive learning facilities for young children.

212. *Methods in Preschool Education.* I. 3 hr. PR: Ed. F. 1 or C&I 7 or equiv. Development of an experiential model of teaching young children. Application of methods in basic needs areas of nursery-early childhood education consistent with an experiential model of teaching. Emphasis on safety, multicultural education, classroom management, working with special needs populations and mainstreaming, and cooking and nutrition.

214. *Creative Experiences in Early Childhood.* II. 3 hr. PR: Ed. F. 1 or C&I 7 or equiv. Examination of creative experiences for young children and their relationship to child development. A special focus on play behavior as a learning medium with emphasis on program planning, curriculum development, and instructional strategies.

216. *Early Language and Communication Experiences.* I. 3 hr. PR: Ed. F. 1 or C&I 7 or equiv. This course presents activities for developing language and communication skills in children 2-5 years of age. It covers a broad range of temporary and enduring forms of communication in visible and audible media.

218. *Management of Preschool Education.* II. (Alternate Years.) 3 hr. PR: Ed. F. 1 or C&I 7 or equiv. (A field experience with children 2-5 years of age is required.) Planning, designing, and assessing programs for children ages 2-5 years with emphasis on management skills.

224. *Approaches to Teaching Language.* II. 2 hr. PR: Lingu. 1 and Engl. 111. Designed for prospective teachers of English and language arts. Focus is upon planning and implementing methods of teaching English as a language. Materials and resources appropriate to public school instruction are analyzed and utilized.

225. *Approaches to Teaching Literature.* II. 2 hr. PR: Junior standing. Designed for prospective teachers of English and language arts. Course focuses upon methodologies for teaching literature in public schools. Workshop format will provide opportunities for peer teaching activities as students apply methods of teaching literature.

267. *The Music Education Program.* S. 3 hr. PR: Consent. Organization and administration of the complete music education program for grades 1-12.

280. *Special Problems and Workshops.* I, II, S. 2-4 hr. (Maximum of 8 semester hours may be applied toward the master's degree.) PR: 14 hr. in education. Credits for special workshops and short intensive unit courses on methods, supervision, and other special topics.

287. *Advanced Clinical Experience.* I, II, S. 1-6 hr. PR: Consent. Clinical experience in teaching-learning situations at any level.

300. *U.S. Education for International Students.* I. 3 hr. PR: International students with graduate status and developing oral and written English skills. To assist international students in understanding the U.S. system of education. Included: dominant U.S. values related to education; structure of U.S. education at all levels; models and strategies; field trips; international comparisons.

301. *The Elementary-School Curriculum.* I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. Analysis of curriculum designs in elementary education with emphasis on methods and techniques of development.

306. *Curriculum for Middle Childhood.* I, S. 3 hr. Survey course which includes: historical, social, and cultural influences on the curriculum; the learner characteristics; curriculum and instructional organization and their relationship to facilities available; evaluation and implementation of middle childhood curriculum.

307. *Curriculum Development.* I, II, S. 3 hr. PR: C&I 301 or 304 or C&I 312 and Ed. F. 320 or consent. Basic foundation in the concepts underlying the school curriculum in American society.

308. *Introduction to Alternative Learning Environments.* I. (Alternate Years.) 3 hr. This course will provide opportunities for educators to explore and analyze the trends and issues in alternative learning environments in public education.

309. *Experiences in Alternative Learning Environments.* S. (Alternate Years.) 6 hr. PR: C&I 308, Ed. F. 320, consent. This course helps teachers to learn and practice skills that are needed to be an effective teacher in an alternative teaching environment.

312. *Early Childhood Curriculum.* I. 3 hr. PR: C&I 210, 211, or consent. Historical, theoretical perspectives in curriculum development for early childhood education including social, creative, cognitive, and physical goals.

314. *Early Childhood Instruction.* II. 3 hr. PR: C&I 210, 211, or consent. Design of instruction for individualization and development of mastery in curriculum goals for early childhood.

316. *Early Childhood Program Development and Evaluation.* I. 3 hr. PR: C&I 210, 211 or consent. Development and evaluation of facilities, programs, and support systems for early childhood education.

317. *Language Skills in Early Childhood.* S. 3 hr. PR: Consent. An examination of language skills and the sequence in which they are learned in early childhood with special attention to the environment of instructional influences which could contribute to their acquisition. (Offered in alternate summers.)

318. *Storytelling in Early Childhood.* I, II. 3 hr. This course will assist students in telling, reading, and creating stories for children. Techniques, methods, and research effective in the art of storytelling will be examined and applied as they relate to total child development.

319. *Behavior Modification: Early Childhood Education.* S. 3 hr. PR: Consent. Application of behavior modification to early childhood education with special attention to an examination of the methods and values involved. (Offered in alternate summers.)

330. *Mathematics in the Elementary School.* I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education or consent. Materials and methods of instruction for modern mathematics programs.

333. *Corrective Techniques in Mathematics Education.* I, S. 3 hr. PR: Consent. Materials and methods used in diagnosis and remediation of learning difficulties in mathematics.

337. *Mathematics in the Junior High School and Middle School.* II. 3 hr. PR: 6 hr. college mathematics or consent. Study of teaching of mathematics in the junior high school and/or middle school; application of mathematics content to teaching; instructional techniques and materials.

340. *Science in the Elementary School.* I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. Analysis of methods, curriculum patterns, and trends in elementary school science. Understanding and development of scientific attitudes appropriate at the elementary-school level.

344. *Science in the Secondary School.* 3 hr. PR: Consent. Nature and function of science in secondary schools supported by current research and development; includes analysis of structure and practice of science curriculum and instruction issues. 3 hr. lec.

350. *Social Studies in the Elementary School.* I, II, S. 3 hr. PR: 20 hr. of undergraduate credit in elementary education, or consent. Comprehensive consideration of objectives, content, methods, including unit procedures; materials including objects, models, exhibits, and museum items, as well as textbooks, collateral reading, maps, and graphs; means of evaluating social growth and development.

357. *Principles of Economic Education.* S. 3 hr. Workshop for principals, teachers, and supervisors with emphasis on the economic structure of our society and methods of integrating economics into the school program. (Sponsored jointly by College of Human Resources and Education and College of Business and Economics.)

359. *Classroom Simulation Techniques.* II, S. (Alternate Years.) 3 hr. To provide experience in the use of learning games and simulations as an instructional technique and the opportunity to develop—under supervision—simulated activities and games to be used in a variety of learning environments.

373. *Professional Development.* I, II, S. 1-6 hr. (May be repeated for credit.) PR: Department consent. Specially designed experiences for those interested in advancing professional skills in a particular specialty. (Not for degree credit in programs in the College of Human Resources and Education.) (Graded as S/U.)

377. *Children's Television: Problems and Potentials.* S. 4 hr. PR: Consent. Provides parents and teachers with strategies for monitoring, evaluating, and directing television viewing habits of youth; pertinent research studies, school and community action programs, and home and school education programs are discussed and practiced.

380. *Special Topics.* I, II, S. 1-6 hr. PR: Consent.

383. *Seminar.* I, II, S. 1-6 hr. PR: Consent.

385. *Supervision of Student Teachers.* I, II, S. 3 hr. PR: Consent. For persons working or intending to work with education students in field experiences. Course focuses on the development and application of supervisory skills involved in effective guidance of student teachers and education students.

386. *Teaching Strategies for Middle Childhood.* II, S. 3 hr. Surveys instructional strategies appropriate for facilitating preadolescent learning. Includes the role of the teacher; how the teacher uses resources within and outside the classroom as they relate to instruction of the learner, age 10-14 years.

387. *Advanced Teaching Strategies.* I, II, S. 3 hr. PR: Graduate standing. Deals with methods as one critical variable in teaching. Examines ways and means to describe, plan the use of, implement, and evaluate teaching methods. Analysis and implementation of teaching methods and component skills of teaching.

388. *Classroom Organization and Management.* I, S. 3 hr. Discusses research identifying components of classroom organization and environment which influence learning; reviews teacher behaviors and learning activities which research indicates lead to more effective teaching. Stresses implementation strategies relevant to classroom settings.

389. *Education That Is Multicultural.* I, S. 3 hr. PR: Graduate standing or consent. Provides opportunities for educators to increase awareness of their own ethnic backgrounds, foster understanding of racial/ethnic diversity, and develop appropriate teaching materials and methods for elementary and secondary curricula.

391. *Advanced Topics.* I, II, S. 1-6 hr.

395. *Practicum.* I, II, S. 1-12 hr. per sem. or session—aggregating not more than 12 hr. PR: 9 graduate hr. in Education. (Enrollment with permission of adviser or instructor in consultation.) Special individual and group projects. To provide appropriate residence credits for special workshops, prolonged systematic conference, or problems and projects in education.

407. *Instructional Models of Teaching.* II. 3 hr. PR: Ed. F. 320 or consent. Concepts and processes involved in teaching and their relationship to the development of teacher education programs.

408. *Contemporary Determinants of Curriculum.* II, S. 3 hr. PR: C&I 307 and Ed. F. 340 or consent. Contemporary determinants of curriculum development.

409. *Curriculum Theories.* I, II, S. 3 hr. PR: C&I 408 or consent. Theories underlying curriculum from the past to the present and projected to the future.

438. *Survey of Major Issues in Mathematics Education.* II, S. 3 hr. PR: Consent. Individual and group research on selected topics in mathematics education.

457. *Social Studies Curriculum Development, K-12.* I. 3 hr. PR: C&I 301 or 304 and C&I 350 or 354. Stresses the application of principles and procedures pertinent to the development of social studies programs in elementary and secondary schools. Strong emphasis will be placed on the analysis of current social studies curriculum materials.

488. *Higher Education Curriculum.* II. 3 hr. Analysis and evaluation of post-secondary curriculum with emphasis on organizing, translating, and applying findings. Topics include curriculum shaping forces; institutional patterns; policy, components and change; and principles and techniques of development, experimentation, and evaluation.

489. *Teaching in Higher Education.* I. 3 hr. PR: Graduate standing. A general methods course involving instructional concepts and strategies for present/prospective faculty in higher education. Comprehensive consideration of objectives, planning criteria and methods, teaching strategies, and evaluation in meeting the needs of adult learners.

490. *Teaching Practicum.* I, II, S. 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility. Provides a supervised experience in a teaching situation. (Graded as S/U.)

491. *Advanced Study Project in Education.* I, II, S. 3-6 hr. Research for the program leading to the Certificate of Advanced Study in Education (C.A.S.).

496. *Advanced Seminar.* I, II. 1 hr. PR: Consent. Opportunity for the advanced graduate student to present the student's research to faculty and/or student groups.

497. *Research.* I, II, S. 1-15 hr.

499. *Colloquium in Curriculum and Instruction.* I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit, but who wish to participate in academic programs.

ENDODONTICS

Arthur E. Skidmore, Chairperson of the Department

1067 Health Sciences Center

Degree Offered: Master of Science

Graduate Faculty: Members Biddington, Rice, and Skidmore.

Master of Science (M.S.)

The School of Dentistry and its Department of Endodontics offer a program of advanced study and clinical training leading to the degree of master of science (M.S.). The program requires a minimum of 24 months (two academic years and two summer sessions) of full-time residency in the School of Dentistry and is designed to qualify dentists for careers in endodontic clinical practice, teaching, and research.

Inquiries concerning this program should be directed to the Office of the Associate Dean for Postdoctoral Programs. Applicants will be processed in the School of Dentistry. Applicants approved for admission to the program will be notified soon after December 1.

Requirements for Admission to the Endodontic Program

1. Graduation from an accredited school of dentistry.
2. Evidence of scholastic and clinical achievement that would indicate the applicant's ability to progress in a program of this nature.
3. Each applicant must file with the Department of Endodontics all information requested in the departmental application form.

Requirements for Master of Science Degree

1. Fulfillment of general WVU graduate study requirements.
2. Twenty-four months (two academic years and two summer sessions) of consecutive residency at the WVU School of Dentistry.
3. An approved master's thesis based on original research completed during the period of residency in an area related to endodontics.
4. Must satisfactorily pass a final oral examination.
5. Must complete a minimum of 57 credit hours. These include 32 hours of endodontic courses, a minimum of 18 hours of selected basic sciences subjects, and a thesis (seven hours).
6. Must have demonstrated satisfactory clinical competency in the student's field.
7. Must have maintained a grade level commensurate with graduate education.

Dentistry (Dent.)

400. *Advanced Oral Surgery. I, II, S. 1-12 hr. PR: Consent. Advanced study of therapeutics, hospital protocol, and surgical aspects of oral surgery involving lectures, seminars, demonstrations, and clinical applications.*⁴

Endodontics (Dent.)

390. *Clinical Endodontics. I, II, S. 1-5 hr. (May be repeated for credit.) PR: Graduate of an accredited dental school and admission to the Advanced Education Program in Endodontics or consent. Clinical endodontic practice in the areas of: ordinary endodontic cases, complex endodontic cases, hemisection, root amputation, replantation, transplantation, endodontic implantation, vital pulp therapy, apexification, and bleaching.*

391. *Endodontic Theory*. I, II, S. 2 hr. PR: Consent. Provides seminar discussions in the topics of: basic endodontic techniques, advanced endodontic techniques, endodontic literature review, case presentation, and advanced endodontic theory.

490. *Endodontic Teaching*. S. 2 hr. PR: Consent. Selected teaching experiences including lecture, clinical, and laboratory teaching of undergraduate endodontic courses.

497. *Endodontic Research*. I, II, S. 2-3 hr. PR: Consent. Students will prepare a research protocol, conduct experimental research, and prepare a thesis of original endodontic research.

Microbiology (M. Bio.)

317. *Special Problems in Microbiology*. I, II, S. 1-7 hr. per sem. with a total of 24 hr. available. Pathogenic microorganisms, including immunology and antimicrobial agents.

Pathology (Path.)

382. *Oral Histopathology*. I, II. 1-2 hr. PR: Path. 338, 353, consent. Microscopic study of head and neck lesions.

401. *Special Studies in Oral Pathology*. I, II. 1-3 hr. PR: Consent. Advanced seminar or independent study of local and/or systemic disease processes affecting oral and facial structures.

Pharmacology and Toxicology (Pcol.)

360. *Pharmacology*. I. 4 hr. PR: Dental student standing or consent. Lecture and demonstrations on pharmacologic actions and therapeutic uses of drugs.

Statistics (Stat.)

311. *Statistical Methods 1*. I, II. 3 hr. PR: Math. 3. Statistical models, distributions, probability, random variables, tests of hypotheses, confidence intervals, regression, correlation, transformations, F and Chi-square distributions, analysis of variance and multiple comparisons. (Also listed as Ed. P. 311 and Psych. 311.)

ENGLISH

Rudolph P. Almasy, Chairperson of the Department

Frank Scafella, Ph.D. Supervisor

Timothy Adams, M.A. Supervisor

Stansbury Hall

Degrees Offered: Master of Arts, Doctor of Philosophy

Graduate Faculty: Members Adams, Allen, Blaydes, Conner, Davis, Eaton, French, Gandolfo, Ginsberg, Miles, Nelson, O'Donnell, Oderman, Scafella, Stasny, Stitzel, Torsney, B. Ward, and H. Ward. Associate Members Almasy, Buck, Fuller, High, MacDonald, Madison, Peterson, Racin, Sailer, Sedley, and Thomas.

Master of Arts (M.A.)

Admission. To be admitted to the Department of English as prospective candidates for the degree of master of arts (M.A.), students are expected to have completed work comparable to the department's undergraduate requirement for English majors (but with records distinctly above the average), and to present as part of their applications their scores on the Graduate Record Examination General Aptitude Test, and, if non-native speakers of English, their TOEFL scores. Past experience has shown that successful graduate students usually score at least at the 60th percentile in the verbal section of the GRE.

The applicant may be admitted as a regular graduate student—one who is approved for a degree program; as a provisional graduate student—one who is accepted for study but at the time of acceptance does not meet all the requirements for regular admission; or as a non-degree graduate student. (The GRE and TOEFL scores are not required of non-degree graduate students.)

Course Requirements. A candidate for the M.A. degree is expected to complete courses covering the major periods and the works of the major authors of English and American literature. The minimum requirement is 30 hours of graduate work in English, 24 hours of which must be on the 300-400 course levels. English 492, Introduction to Literary Research, is required of all master's degree candidates, and must be taken in the first year of graduate study. Two 400-level seminars are also required. (Neither English 490, required of all teaching assistants, nor English 492 may be substituted for the seminar requirements.) No more than six hours of course work outside the Department of English may apply towards the 30-hour requirement. Any hours outside the Department of English to be applied to the requirement must be relevant to the student's program and approved by the graduate supervisor before registration. Students should check with the English Department about the most current courses available.

Thesis Option. A candidate for the M.A. degree has the option of taking 30 hours of course credit, with the above requirements, or of taking 24 hours of course work and writing a thesis, for six hours credit, under the supervision of a thesis adviser. Information about the procedure for filing application for approval of projects, and about dates for the submission of theses, is available at the department office. The thesis may be a work of scholarship, of criticism, or of creative writing (original poetry, drama, or fiction). A candidate may register for up to 12 hours of thesis credit, but only six hours may be included in the 30 hours required for the degree. Thesis hours will be graded as S (Satisfactory) or U (Unsatisfactory) progress.

Examinations. A student electing to write a thesis is expected to make an oral defense of the finished work before his/her thesis committee. All students, whether they elect the thesis option or the 30-hours' course work option, are required to take two three-hour comprehensive written examinations in English and American literature. Each student taking these examinations will have the option, elected and approved in advance of the examination date, of having part of the comprehensive examination restructured to provide that student the opportunity of being examined in a specialized area of expertise in literary, linguistic, or writing studies. The only question for which such a substitution may not be made is the analysis of a short poem: answering this question is required of all students taking the examinations.

The student will normally take these examinations in the semester or session following that in which the student has established acceptable credit in 24 hours of graduate course work with a minimal average of 3.0. The examinations will be conducted not later than four weeks before the last day of classes of a semester, or three weeks before the end of a summer session. With the permission of the examining committee, an unsuccessful candidate may be reexamined. Success in the examinations admits the student to candidacy for a graduate degree.

Foreign Language Requirement. A candidate for the degree of master of arts in English must demonstrate proficiency in one foreign language by passing the Graduate Reading Examination in that language.

Doctor of Philosophy (Ph.D.)

Admission. An applicant for admission to the program will be judged on the bases of academic record, three recommendations from former teachers, a written statement outlining the applicant's academic and professional goals, and the Graduate Record Examination Advanced Test scores. If a non-native speaker of English, the applicant must also present the TOEFL scores.

Provisional admission to the program may be granted to students whose credentials, while not exhibiting the high standards of prior academic achievement the department expects of doctoral candidates, promise excellence in the graduate study of English literature. Students admitted provisionally are expected to show high academic achievement during their first semester of doctoral study. All decisions on admission and status shall be made by the Ph.D. admissions committee.

Course Requirements. The doctoral program will normally require three years of full-time study beyond the master's degree or its equivalent. Thirty hours of credits in courses of the 300 and 400 series are normally required; however, exceptionally well-prepared students may be granted permission to take fewer than 30 hours of course work, upon recommendation of the Ph.D. admissions committee, in consultation with the Ph.D. supervisor and the graduate program committee. Of the normally required 30 hours, nine must be taken in 400-level seminars. All doctoral candidates, unless they have previously had what the department recognizes as an equivalent course, must take English 492 (Introduction to Literary Research). Neither English 490 (required of all teaching assistants) nor English 492 may be substituted for the seminar requirements. English 488, Current Directions in Literary Study, is also required of every doctoral student in the program.

No credit will be given for courses in which the grade is C or less. A student who makes C or less in more than three courses will be dropped from the program.

The writing of the doctoral dissertation will carry a value of 12 additional hours.

Preliminary Qualifying Examinations. A doctoral student who did not receive the M.A. in English from WVU may be asked to take and pass the department's M.A. comprehensive examination. This must be done no later than the end of the student's first year of study.

Examination for Formal Admission to Candidacy. When the student has completed the course work and has fulfilled the foreign language requirement, an examination committee will be appointed. The student and the examination committee will draw up a list of books on which the examination for formal admission to candidacy will be based. The reading list must be approved by the graduate program committee at least one semester before the examination is administered. The examination will be both written and oral.

Ph.D. candidates will be questioned in three areas of special expertise: (1) the proposed dissertation project and immediately related critical readings; (2) the larger literary-historical period (e.g. the areas identified in the M.A. comprehensive examination) in which the project fits or out of which it grows; and (3) a major period or area—historical, theoretical, or generic—that may be related to the first two fields of questioning but should not overlap.

The oral examination, approximately two hours in length, is meant to permit the examination committee to pursue issues raised by the written examination, and to permit the student to clarify, expand on, or to raise questions about the texts and issues on which the examination was based.

Teaching Requirement. While in the program, the doctoral student must teach successfully in the department for two semesters, one semester devoted to composition, the other to literature. Concurrent with the teaching practicum, the student must take one 400-level course in the teaching of composition and one 400-level course in the teaching of literature (neither of which qualifies as a 400-level seminar). This requirement will be optional for those candidates who possess teaching experience approved by the department.

Minor Subject. A student may, though need not, choose a minor, not to exceed 12 hours in 300- or 400-level courses, in a related subject offered by another department. Choice of the minor is subject to the approval of the Ph.D. Supervisor.

Foreign Language Requirement. The student must demonstrate proficiency in a foreign language acceptable to the Department of English by passing a graduate reading examination in that language.

Doctoral Dissertation. After completing course work, passing the examinations for formal candidacy, and fulfilling the language requirement and teaching requirements, the student shall submit a prospectus of the dissertation, as specified by the department, to the adviser. On approval of the prospectus by the student's dissertation committee, the student may apply for admission to candidacy for the Ph.D. degree.

The topic of the proposed dissertation should be such that a candidate can reasonably complete the project in one year of full-time work. It is the responsibility of the dissertation committee and adviser to see that the topic is sufficiently limited.

Final Examination. When the dissertation has been accepted and approved by the candidate's adviser and the dissertation committee, the candidate will be given an oral examination by the committee. The examination will deal with the dissertation and the field it represents.

English (Engl.)

201. *Creative Writing Workshop: Fiction.* I, II. 3 hr. Advanced workshop in creative writing for students seriously engaged in writing fiction.
202. *Creative Writing Workshop: Poetry.* I, II. 3 hr. Advanced workshop in creative writing for students seriously engaged in writing a major group of poems.
208. *Scientific and Technical Writing.* I, II. 3 hr. PR: Engl. 1 and 2. Writing for scientific and technical professions. Descriptions of equipment and processes; reports and proposals; scientific experiments; interoffice communications; articles for trade and research journals.
210. *Structure of the English Language.* I, II. 3 hr. Historical, comparative, and descriptive grammar, together with an introduction to English linguistics.
211. *History of the English Language.* I, II. 3 hr. Study of the nature of the language; questions of origins, language families, development, relationships of English as one of the Indo-European languages.
220. *American Poetry.* I, II. 3 hr. Major American poets of the nineteenth and twentieth centuries.
223. *Modern American Poetics.* I, II. 3 hr. A close study of those poets who have shaped the aesthetics of contemporary American poetry.
232. *Literary Criticism.* I, II. 3 hr. Literary criticism from Aristotle to modern times.
235. *American Drama.* I, II. 3 hr. Representative American dramas and history of theatre in America.

236. *Tragedy*. I, II. 3 hr. Masterpieces of tragedy from Greek times to modern, with consideration of changing concepts of tragedy and of ethical and ideological values reflected in works of major tragic authors.

240. *Folk Literature*. I, II. 3 hr. The folk ballad, its origin, history, and literary significance, based on Child's collection and on American ballad collections.

241. *Folk Literature of the Southern Appalachian Region*. I, II. 3 hr. Traditional literature of southern Appalachian region, including songs, prose, tales, languages, customs, based on material collected in the region—especially in West Virginia.

245. *Studies in Appalachian Literature*. I, II, S. 3 hr. Studies of authors, genres, themes, or topics in Appalachian literature.

250. *Shakespeare's Art*. I, II, S. (Alternate Years.) 3 hr. Special studies in Shakespeare's tragedies, comedies, and/or history plays, with some attention given to his non-dramatic poetry. With emphases varying from year to year, studies may include textual, historical, critical, and dramaturgical-theatrical.

255. *Chaucer*. I, II. 3 hr. Early poems, *Troilus and Criseyde*, and *The Canterbury Tales*. In addition to an understanding and appreciation of Chaucer's works, the student is expected to acquire an adequate knowledge of Chaucer's language.

256. *Milton*. I, II. 3 hr. All of Milton's poems and a few selected prose works.

261. *Sixteenth Century Prose and Poetry*. I, II. 3 hr. Studies from Caxton to Bacon, from Skelton to Shakespeare.

262. *Seventeenth Century Prose and Poetry*. I, II. 3 hr. Studies from Donne to Dryden.

263. *Literature of the Eighteenth Century*. I, II. 3 hr. Literature of the period 1660-1744 in relation to social, political, and religious movements of the time.

264. *Literature of the Eighteenth Century*. I, II. 3 hr. Continuation of Engl. 263, covering the latter half of the century. May be taken independently of Engl. 263.

265. *The Romantic Movement*. I, II. 3 hr. A survey of the works of the major British Romantic writers along with an introduction to works of scholarship in British Romanticism.

266. *American Romanticism*. I, II. 3 hr. Writings of Ralph Waldo Emerson, Henry David Thoreau, and Nathaniel Hawthorne. A study of relations of these men to history of their own time; their contributions to American thought and art.

267. *Victorian Poetry*. I, II. 3 hr. The major Victorian poets—Tennyson, Browning, Arnold, Rossetti, Morris, Swinburne, Fitzgerald—and a few of the later Victorian poets.

268. *Modern British Poetry*. I, II. 3 hr. British poetry from 1880 to present, including the Decadents, Counter-Decadents, Hopkins, Housman, Hardy, the Georgians, the Imagists, World War I poets, Yeats, Eliot, the Auden Group, and post-World War II poets.

280. *Southern Writers*. I, II. 3 hr. Twentieth-century Southern essayists, poets, short-story writers, and novelists in relation to ideological background.

283. *Study of Selected Authors*. I, II. 3 hr. Study of the works of one or more major authors. (May be repeated with a change in course content for a maximum of 9 credit hours.)

288. *Women Writers in England and America*. I, II. 3 hr. Syllabus may vary from year to year to include writers in a particular country, historical period, or genre; or writing on a particular theme.

290. *Independent Study*. I, II. 1-3 hr. (With departmental consent, may be repeated for a maximum of 9 credit hours.) PR: Departmental consent. Individual study of literary, linguistic, and writing problems.

293. *Practicum in Teaching Composition*. I. 1 hr. PR: Engl. 108, 295. Designed to give prospective English and language arts teachers supervised practical experiences in individual writing tutorials.

294. *Fiction for Adolescents*. II. 3 hr. Designed for prospective teachers of English and language arts. Course focuses on recent fiction for adolescents as well as on traditional literature appropriate to the needs, interests, and abilities of youth. Evaluation criteria emphasized.

310. *Old English 1*. I, II. 3 hr. Study of Anglo-Saxon with selected readings from the literature of the period.

311. *Old English 2*. I, II. 3 hr. PR: Engl. 310. *Beowulf* and other texts in Old English.

312. *Medieval Literature*. 3 hr. Readings in the literature of the Medieval Period; attention to major writers and genres; focus on literary theory. 3 hr. lec.

313. *Renaissance Literature*. 3 hr. Readings in the literature of the English Renaissance; attention to major writers and genres; focus on literary history. 3 hr. lec.

314. *Restoration and Eighteenth-Century Literature*. 3 hr. Readings in the literature of England during the Restoration and the Eighteenth Century; attention to major writers and genres; focus on literary history. 3 hr. lec.

315. *Romantic Literature*. 3 hr. Readings in the literature of England during the Romantic Period; attention to major writers and genres; focus on literary history. 3 hr. lec.

316. *Victorian Literature*. 3 hr. Readings in the literature of England during the Victorian Period; attention to major writers and genres; focus on literary history. 3 hr. lec.

317. *Twentieth-Century British Literature*. 3 hr. Readings on the literature of England during the Twentieth-Century; attention to major writers and genres; focus on literary history. 3 hr. lec.

320. *Studies in Composition and Rhetoric*. 3 hr. Integration of theory with pedagogy for effective instruction, composition and rhetoric. Historical development of composition theory and current issues in rhetoric. 3 hr. lec.

321. *Studies in Drama*. 3 hr. Advanced study in the genre of drama, with emphasis varying from year to year. Course may include textual, historical, critical, formalist, and/or theoretical study. Not restricted to any one period or century.

322. *Studies in Poetry*. 3 hr. Advanced study in the genre of poetry, with emphasis varying from year to year. Course may include textual, historical, critical, formalist, and/or theoretical study. Not restricted to any one period or century.

323. *Studies in the Novel*. 3 hr. Advanced study in the genre of the novel, with emphasis varying from year to year. Course may include textual, historical, critical, formalist, and/or theoretical study. Not restricted to any one period or century.

324. *Studies in Nonfiction Prose*. 3 hr. Advanced study in the genre of non-fiction, with emphasis varying from year to year. Course may include textual, historical, critical, formalist, and/or theoretical study. Not restricted to any one period or century.

325. *Study of Selected Authors*. 3 hr. Advanced study of one or more major authors.

350. *Shakespeare*. I, II. 3 hr. Intensive study of selected plays. Special attention to textual problems and to language and poetic imagery, together with the history of Shakespearean criticism and scholarship.

370. *American Literature to 1865*. 3 hr. Readings in the literature of America from its beginnings to 1865; attention to major writers and genres; focus on literary history.

371. *American Literature, 1865-1915*. 3 hr. Readings in the literature of America from 1865-1915; attention to major writers and genres; focus on literary history.

372. *American Literature, 1915-Present*. 3 hr. Readings in the literature of America from 1915 to the present; attention to major writers and genres; focus on literary history.

383. *Recent Literary Criticism*. I, II. 3 hr. Brief survey of theories of major schools of modern criticism and an application of these theories to selected literary works.

392. *Special Topics*. I, II, S. 1-9 hr. PR: Consent. Advanced study of special topics in language, literature, or writing.

400. *Thesis*. I, II. 3 hr.

401. *Thesis*. I, II. 3 hr.

440. *Seminar in Medieval Studies*. I, II. 3 hr. Topics from English literature, 1100-1500.

446. *Seminar in Renaissance Studies, 1550-1660*. I, II. 3 hr. Studies in major authors and special topics in the Renaissance.

460. *Seminar in Restoration and Eighteenth Century Studies*. I, II. 3 hr.

470. *Seminar in British Romanticism*. I, II. 3 hr. Studies in major authors and special topics in the field of British Romanticism.

476. *Seminar in Victorian Studies*. I, II. 3 hr. Research and discussion in selected topics in the literature and history of the period.

484. *Seminar in American Studies*. I, II. 3 hr. Seminar in principal authors and movements in American literature.

485. *Seminar in Twentieth-Century British Studies*. 3 hr. Seminar in principal authors and movements in twentieth-century British literature.

488. *Current Directions in Literary Study*. II. 3 hr. PR: Advanced graduate standing (English 383 recommended). Intensive study of one or more current approaches to literature and theories of criticism, with some emphasis on the interrelations of literary study with other disciplines.

490. *Teaching Practicum*. I, II. 3-6 hr. I—Supervised practices in college teaching of expository writing. II—Supervised practices in college teaching of literature.

491. *Advanced Study*. I, II. 3 hr. Specific topics approved by the instructor.

492. *Introduction to Literary Research*. I, II. 3 hr. Bibliography; materials and tools of literary investigations; methods of research in various fields of literary history and interpretation; problem of editing. Practical guidance in the writing of theses.

493. *Folger Institute Seminar*. I, II. 3 hr. PR: Graduate standing. (Enrollment is by special application only. Contact department chairperson for information.) Seminar conducted by distinguished scholars and held at the Folger Institute of Renaissance and Eighteenth Century Studies in Washington, D.C. Topics vary. (Also listed as Hist. 493.)

494. *Seminar*. I, II. 3 hr. Specific authors to be approved by instructor.

497. Research. I, II. 1-15 hr. PR: Consent.

498. Doctoral Thesis. I, II. 1-6 hr. PR: Consent.

499. Graduate Colloquium. I, II. 1-6 hr. PR: Consent. Credit for this course may not be applied toward satisfaction of the 30-hour degree requirements at either the master's or doctoral level.

ENTOMOLOGY

Linda Butler, Chairperson of the Entomology Graduate Program

G-166 Agricultural Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Amrine, Butler, Hogmire, and Weaver. Associate Member Baniecki.

Entomology is the study of insects and their arthropod relatives. Students entering the M.S. program in entomology are expected to have an adequate background in biological and physical sciences. Admission requirements are those of the College of Agriculture and Forestry. Additional undergraduate course work may be required to make up deficiencies or to meet the needs of the area of specialization of the student.

Thesis problems in entomology may be selected in areas of pest management; entomology of crops, forests, or urban environments; apiculture; aquatic entomology; medical or veterinary entomology; acarology; araneology; or insect physiology, morphology, ecology, behavior, or systematics. The entomology curriculum is offered by the entomology faculty in the College of Agriculture and Forestry.

Course work and thesis research in entomology are designed to prepare students for professional careers in entomology and closely related areas of agricultural, biological, and environmental sciences. Graduates of the entomology program are employed by state and federal agencies, private industry, educational institutions, or become self employed.

Facilities for graduate research include experiment farms, greenhouses, laboratories, specialized equipment, and the WVU Arthropod Collection.

Entomology students seeking to pursue a Ph.D. should apply for acceptance into the Ph.D. program in Agricultural Sciences.

Entomology (Ento.)

201. Apiculture. II. 3 hr. PR: Biol. 1 and 2, or consent. Development, physiology, and behavior of the honey bee with emphasis on colony management, pollination, diseases of bees; properties of honey and beeswax.

202. Apiculture Laboratory. II. 1 hr. PR: Concurrent or previous enrollment in Ento. 201. Identification and anatomy of honey bees, assembly and use of beekeeping equipment, field management of honey bees, examination for diseases and pests, production of queens and nuclei.

204. Principles of Entomology. I. 4 hr. PR: Biol. 1 and 2 or equiv. Basic course dealing with the anatomy, morphology, physiology, reproduction, systematics, ecology, and management of insects.

210. Insect Pests in the Agroecosystem. I. 3 hr. PR: Ento. 204 or consent. Life cycle, damage, and economic impact of pestiferous insects in the agroecosystem. Included are insect pests of agricultural and ornamental plants, stored products, structures, and livestock. 2 lec., 1 lab.

212. Pest Management. II. 3 hr. PR: Ento. 204 or consent. An in-depth look at current problems and solutions in controlling insect pests in an environmentally compatible manner. Management techniques include cultural, mechanical, physical, biological, regulatory, and chemical practices. 3 lec.

390. Special Topics. I, II, S. 2-6 hr. PR: Ento. 204 or equiv., or consent. Each of the following courses is given every other year: Exopterygota; Endopterygota Part I, Part II; Larval Insects; Acarology; Araneology; Pesticides in the Environment; Insect Morphology; Insect Physiology; Medical Entomology.

450. Seminar. I, II. 1 hr. per sem.

497. Research. I, II, S. 1-15 hr.

Plant Science (Pl. Sc.)

200. *Recognition and Diagnosis of Plant Disorders.* I. 4 hr. PR: P. Pth. 201 and Ento. 204. Creates an ability for the student to use systematic inspection to determine cause or causes of a plant disorder.

201. *Principles and Methods of Plant Pest Control.* II. 4 hr. PR: P. Pth. 201 and Ento. 204. Concepts of control and how they are implemented by exclusion, eradication, protection, and immunization.

FAMILY RESOURCES (Home Economics)

Beverly Hummel-Azzaro, *Division Director*

Nancy Rodriguez, *Graduate Program Coordinator*

702 Allen Hall

Degree Offered: Master of Science

Graduate Faculty: Members Albrink, Franz, Head, Liddell, Loyer-Carlson, MacDonald, Nomani, and Rodriguez. Associate Members Ladki and Warash

The graduate program in the Division of Family Resources provides students the opportunity to study for a master of science degree. Three areas of specialization are offered: (1) child development/family studies; (2) home economics education; and (3) human nutrition.

Child Development/Family Studies

The child development and family studies program is structured to give students a basis from which to conduct research and to work with families and children in educational and clinical settings. In addition, the program prepares students for entering Ph.D. programs in child development and family studies, family life education, psychology, or counseling.

Courses in child development and parenting strategies are supplemented with field experience in a variety of settings, such as the Child Development Laboratory, the hospital neonatal intensive care and pediatric units, and parenting education programs in the community.

Individuals choosing an emphasis in child development and family studies may select from a wide variety of careers which include employment as child care specialists, early childhood teachers, developmental specialists, child life educators, parent educators, and extension specialists.

Home Economics Education

The master of science degree program in home economics education prepares home economists for teaching in vocational programs in both middle and secondary schools, grade 5-12. The teacher educator program at West Virginia University has been approved by the National Council for

Accreditation of Teacher Education (NCATE). Experienced educators focus a program of study on content updates and advanced course work in areas of specialization, including textiles and clothing, foods and nutrition, interior design, and child development.

For students new to the field of education, candidates may select the option of combining a teaching certification program with a Master's degree program. For candidates interested in a broad array of subject matter, such as the extension or community service fields, a personalized program can be designed.

Human Nutrition

The human nutrition program offers students a variety of opportunities in clinical and applied nutrition as well as the potential for gaining full eligibility for the dietetics registration exam. In addition, the program prepares students for entering Ph.D. programs in nutrition, nutrition education, nutritional biochemistry, and food science.

A variety of research opportunities with the human nutrition and foods faculty is offered to students as collaborative opportunities are available with the WVU Health Sciences Center, the Gerontology Center, the exercise physiology program, and with the West Virginia child nutrition programs.

Background courses in nutrition, foods, general and organic chemistry, and the biological sciences are helpful to students selecting the human nutrition area for specialization. Individuals choosing an emphasis in human nutrition may select from a wide variety of careers, which include employment in hospitals, clinics, industrial and institutional food service organizations, fitness centers, and government-supported health programs.

Master of Science (M.S.)

Admission: Admission requirements are those of the College of Agriculture and Forestry. In addition, students should have completed an undergraduate curriculum in the area of specialization for which they seek admission. A student whose undergraduate degree is in a different field will ordinarily be required to take supplemental undergraduate courses.

Options: Students pursuing a master of science degree in Family Resources have a choice of two options: thesis or research report. The thesis option requires a minimum of 36 hours of coursework, which includes six hours of thesis credit. The research report option requires a minimum of 36 hours of coursework, which includes three hours credit for the research report.

For further information, contact the Graduate Program Coordinator, Division of Family Resources, 702 Allen Hall, P.O. Box 6124, West Virginia University, Morgantown, WV 26506-6124; (304) 293-3402.

Courses of Instruction in Family Resources

Child Development and Family Studies (CD&FS)

211. *Middle Childhood-Early Adolescent Development. I. 3 hr. PR: CD&FS 10. Analysis and investigation of developmental factors in middle childhood-early adolescence. Consideration and diagnosis of physical, emotional, social, familial, moral, and intellectual interactions affecting the child, age 6-14. (Offered in Fall of odd years.)*
212. *Adolescent Development. I. 3 hr. PR: CD&FS 10. Adolescent in contemporary American culture, including normative physical, social, and personality development; relationships within various typical social settings (e.g., family, school, community, peer group). (Offered in Spring of even years.)*

213. *Contemporary Issues in Family Relations.* II. 3 hr. Study of recent research findings in the major areas of family relationships. Topics include effects of divorce upon children, impact of employment upon the marital relationship, and spousal violence.

214. *Family Development.* I. 3 hr. The contemporary family from formation of material unit to death of both spouses. Special attention to the use of the family life cycle and developmental tasks.

215. *Parenting Strategies.* II. 3 hr. PR: Senior or graduate standing or consent. Focus on the interactions between parent and child. Analysis of typical problems which occur in parenting. Deals solely with normal daily situations which often occur in the home.

216. *Child Development Practicum.* I, II. 3-4 hr. Application of child development principles. Involves planning developmentally appropriate activities for 3- and 4-year-old children at the University Child Development Laboratory.

219. *The Growing Years.* II. 3 hr. A televised course offered primarily for off-campus students to become familiar with development of children during their growing years. How to recognize the diversity of approaches in child development research and theory.

341. *Cognitive Development of the Child.* II. 3 hr. Piaget's basic theory, including his view of perceptual, symbolic, motor and logico-mathematical development, across the life span.

345. *Socio-Emotional Development of the Child.* I. 3 hr. A study and examination of contemporary theory and research into various facets of the socialization process in infancy and childhood. (Offered in Fall of odd years.)

348. *Theories of Child Development.* II. 3 hr. Examination of major theoretical conceptions of child development. Work of Werner, Piaget, Freid, Erikson, and the American learning theorists compared and contrasted. (Offered in Fall of even years.)

Family Resources (FAM.R.)

373. *Professional Development.* I, II, S. 1-6 hr. (May be repeated for credit.) PR: Departmental consent. Specially designed experiences for those interested in advancing professional skills in a particular specialty. (Not for degree credit in programs in the College of Human Resources and Education.) (Graded as S or U.)

394. *Practicum/Internship.* I, II, S. 1-6 hr. PR: Consent.

397. *Master's Degree Research or Thesis.* I, II, S. 1-15 hr. PR: Consent.

490. *Teaching Practicum.* I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of home economics.

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

494. *Graduate Seminar.* I, II, S. 1-4 hr. PR: Consent of graduate adviser.

497. *Research.* I, II, S. 1-15 hr. PR: Consent.

498. *Thesis.* I, II, S. 1-6 hr. PR: Consent.

499. *Graduate Colloquium.* I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

Home Economics Education (H.E. Ed.)

219. *Occupational Home Economics.* II. 3 hr. Prepares teachers to implement occupational home economics programs. Emphasis on organizing and administering programs, developing laboratory and work experiences, recruiting students, and evaluating progress.
278. *Vocational Home Economics.* II. 3 hr. PR: Senior standing or consent. Develops an understanding of federal vocational legislation to enable an individual to develop and implement programs in vocational education.
281. *Contemporary Problems in Home Economics.* I. 3 hr. Applies the broad-based philosophy of home economics to current individual family and community problems, e.g., societal impact on families, changing consumer market, changing roles, day care, diminishing energy resources, career education, etc.
311. *Home Economics Curriculum.* I, II, S. 3 hr. PR: Experience in teaching home economics or consent. Theory and research in home economics curriculum. Change in existing programs and development of new programs.
312. *Supervision in Home Economics.* I, II, S. 3 hr. PR: Teaching experience and consent. For home economics teachers preparing to serve as supervising teachers in off-campus training centers.
313. *Evaluation in Home Economics.* I, II, S. 3 hr. PR: 30 hr. of family resources, 7 hr. of education or consent. Experience in devising, selecting, and using a variety of techniques for evaluating progress toward cognitive, affective, and psychomotor objectives in home economics.
314. *Adult Education.* I, II, S. 3 hr. PR: Consent. Psychology of adult learning, philosophy, types of programs to include organization, methods and techniques, and leadership training in working with adult groups.

Home Management and Family Economics (HMFE)

261. *Consumer Economics.* II. 3 hr. Understanding the consumer's role in our economy. Study of research methods and techniques used to identify, understand, and solve consumer problems.
363. *Community Resources for Disabled Homemakers.* I. 3 hr. Provides students with knowledge and skills needed to utilize other disciplines in the team approach to rehabilitating handicapped homemakers. Presentations by team members, such as physicians, nurses, counselors, therapists, social workers, etc.
364. *Home Management for Disabled Homemakers.* II. 3 hr. PR: HMFE 262 or consent. Provides students with skills to teach home management concepts related to the disabled homemaker in performance of household tasks. Emphasis on work simplification, body mechanics, equipment selection, and adaptation to promote independent living.

Human Nutrition and Foods (HN&F)

254. *Experimental Foods.* II. 4 hr. PR: HN&F 55, organic chemistry or consent. Study of basic chemical processes that occur within food systems including the effects of storage, processing, and alterations in formulation on qualities of food products; introduction to laboratory methodology in foods research.
257. *Food, Labor, and Cost Control.* II. 3 hr. PR: HN&F 153, Acctg. 51. Food systems accounting and cost control. Techniques for analyzing, managing, and controlling food and labor costs. (Offered in Spring of even years.)
258. *Food Systems Management Practicum.* II. 4 hr. PR: HN&F 153 and consent. Ten weeks or 400 hours of practical experience in operations of the type in which the student is majoring.

260. *Advanced Nutrition*. I. 3 hr. PR: HN&F 71, physiology. Coreq.: Biochemistry. Role of food nutrients in physiological and biochemical processes of the body; nutritional needs of healthy individuals under ordinary conditions.

261. *Nutrition Laboratory Experimentation*. I. 1 hr. Coreq.: HN&F 260 or consent. Nutrient analysis and introduction to nutrition experimentation.

272. *Community Nutrition 1*. II. 2-3 hr. PR: HN&F 71. Beginning planning for community nutrition for individuals and families at various stages of the life cycle. Roles of agencies and professional groups. Clinical experience in community facilities for the third credit hour optional.

274. *Nutrition in Disease*. 4 hr. PR: HN&F 71; physiology or consent; biochemistry required for dietetics majors. Nutritional care aspect of patients. Modification of diet to meet human nutrition needs in various clinical conditions.

279. *Dietetics As a Profession*. I. 1 hr. PR: Senior standing. Discussion of the profession of dietetics and the professional organization, American Dietetic Association (ADA). Completion of materials to meet ADA membership requirements.

310. *Human Nutrition*. I. 3 hr. Principles of nutrition. Emphasizes current research on nutrient interactions and implications for diet across the life span. (Not for graduate students in Nutrition.)

370. *Human Nutrition Concepts and Application*. II. 3 hr. PR: HN&F 260 or equiv., and consent. Critical study of the nutrient evaluation methods and the nutrient requirements of the human in health and disease, and scope of its application. (Offered Spring Semester of even years.)

Interior Design and Housing (ID&H)

233. *Decorative Arts 1*. I. 3 hr. PR: 9 hr. ID&H. The decorative arts—antiquity to American periods.

234. *Decorative Arts 2*. II. 3 hr. PR: ID&H 233. The decorative arts—American periods to present.

235. *Contemporary Interior Design*. I. 3 hr. PR: ID&H 234. Study of the history of interiors, 1900-present.

238. *Portfolio Design*. II. 3 hr. PR: Senior standing. Development and preparation of a portfolio for interior design and National Council for Interior Design qualifications examination.

239. *Interior Design Field Experience*. II. 3-9 hr.; max. 9 hr. PR: Written consent; senior standing. Opportunity to learn and work within a professional environment with practicing designers.

Textiles and Clothing (Tx & Cl)

221. *Socio/Psychological, Cultural Aspects of Dress*. 3 hr. PR: Tx & Cl 121 and senior standing or consent. Study of social, psychological, and cultural research and literature affecting clothing choices over time. Original research will be conducted by each student.

222. *Fashion Merchandising*. 3 hr. PR: Tx & Cl 121 and junior standing. Study of merchandising activities performed on the retail level including planning sales and assortments, selecting merchandise for resale, controlling inventories, and determining profit. Basic mathematical formulas involved in merchandising are practiced.

224. *Flat Pattern Design*. 3 hr. PR: Tx & Cl 27, 124, 126, or consent. Opportunity for creative expression and for understanding of pattern design through the flat pattern. Apparel designed and constructed by the student.

- 225. Tailoring. 3 hr. PR: Tx & Cl 27, 124, 224 or consent. Comparison of traditional and contemporary tailoring techniques. Student will construct a coat or jacket and skirt or pants.
- 226. *Apparel Design and Illustration*. 3 hr. PR: Tx & Cl 224 or consent. Art principles and fashion terminology explored to analyzing apparel design. Examination of sources of design inspiration. Techniques of drawing using a live fashion model and various media for apparel design presentation.
- 227. *Advanced Textiles*. 3 hr. PR: Tx & Cl 27, 127. Comparative characteristics of all textile fibers. Physical and chemical properties are studied with reference to fiber morphology and/or manufacturing processes.
- 228. *Clothing for Special Needs*. 3 hr. PR: Tx & Cl 224 or consent. Physical, psychological, and sociological clothing needs of individuals with functional limitations. Historical developments, current research, and research needs. Each student conducts a pertinent individual research project.
- 229. *Fashion Merchandising Study Tour*. 1 hr. PR: Senior standing in textiles and clothing. Study of the textiles and clothing industry through on-site visits to: historic costume and textile collections, apparel manufacturing plants, design showrooms, buying offices, pattern companies, and retail establishments. Readings included.

FOREIGN LANGUAGES

Robert J. Elkins, Chairperson of the Department
205-B Chitwood Hall

Degree Offered: Master of Arts

Graduate Faculty: Members Claesges, Fakhri, Gonzalez, Hinckley, M. Lastinger, V. Lastinger, McNerney, Murphy, Reider, Renahan, Schlunk, Spleth, Taylor, and Whitley. Associate Members Bendena, Chang, Dixon, Dunbar, Elkins, Ferreras, Marechal, and Prentiss.

The Department of Foreign Languages offers options for graduate study in French, German, Spanish (peninsular literature as well as Spanish-American literature), the teaching of English to speakers of other languages (TESOL), linguistics, and comparative literature. Graduate courses are also offered in classics, foreign literature in English translation, language teaching methods, and bibliography and research. Candidates for the master's degree are accepted in any of the option areas as long as they fulfill all requirements of the Master of Arts (M.A.) listed below.

The department chairperson is the official adviser for all departmental graduate students. The chairperson, or associate chairperson, serves as temporary adviser until the student requests, and has approved by the associate chairperson, a committee of three or more faculty members during his or her first semester of study. Students should inform themselves of faculty members' areas of expertise early in their first semester in order to facilitate committee selection. The student should request a meeting of his or her committee prior to pre-registration for the second semester to get acquainted and discuss his or her professional goals. The student should develop a close working relationship with the committee and feel free to request a committee meeting whenever necessary—for guidance or course selection, advice on professional advancement, examinations, possible thesis topics, etc. Students may also request a revision of the composition of their committees when professional interests change.

A student is expected to have an undergraduate major in the areas of interest or be required to make up any deficiencies. The student should normally show an average of at least 3.0 (B) in undergraduate foreign language courses.

Requirements

1. Minimum of 24 hours of course work in the department exclusive of 391 and 397 courses. (A total of 36 hours is required.)
2. Maximum of three hours of 397 credit unless a thesis is undertaken, in which case six hours of 397 credit can be applied to the 36 required hours.
3. No more than three hours of 391 credit can be applied to the 36 hours. (An exception can be made only if used to allow a student to enroll in a 200 course and student has already reached the maximum number of 200 credits.)
4. Selection of options in specific areas.

Options:

a. French

Four French literature courses
Linguistics 247—Structure of Modern French
Linguistics 341—History of the French Language
French 217—French Culture or
French 292—French Civilization
French 344—Explication de Textes

b. German

Four German literature courses
Linguistics 257—Structure of German
Linguistics 351—History of the German Language
German 292 or 392—German Culture and Civilization

c. Spanish (Two options)

Option I:

Four peninsular literature courses
Spanish 223—Estudios de Estilo or
Spanish 324—Explicacion de Textos
Spanish 392—Spanish Culture
Linguistics 217—Structure of Spanish
Linguistics 311—History of the Spanish Language

Option II:

Four Spanish American literature courses
Spanish 223—Estudios de Estilo or
Spanish 324—Explicacion de Textos
Spanish 292—Spanish American Culture
Linguistics 217—Structure of Spanish
Linguistics 311—History of the Spanish Language

d. TESOL

Language 293—Methods ESL
Language 392—Theory ESL
Linguistics 392—ESL Linguistics
Language 421—Teaching FL in College
Linguistics 202—Phonology
EFL 391—American Culture

Four courses from the following:

English 211—History of the English Language
English 220—American Poetry
English 235—American Drama
English 340—The American Novel to 1915
English 341—The American Novel 1915 to Present
English 369—American Literature to 1830
English 370—American Literature, 1830-1865
English 371—American Literature, 1865-1915
English 372—American Literature, 1915 to Present

e. Linguistics

Minimum of six linguistic courses including:

Linguistics 202—Phonology
Linguistics 283—Transformational Grammar
Linguistics 284—History of Linguistics
Linguistics 287—Psycholinguistics
Linguistics 288—Sociolinguistics

One culture course of a contrastive nature

In lieu of four literature courses, two of the following can substitute for literature courses: (One may double count for the linguistics requirement for those students writing a thesis.)

Language 341—History of French
Language 351—History of German
Language 311—History of Spanish
English 211—History of English
Linguistics 353—Middle High German
Linguistics 354—Middle High German
Linguistics 313—Old Spanish
Linguistics 343—Old French
English 310—Old English
English 311—Old English

f. Comparative Literature

Eight courses of literature (six of the eight must be in the Department of Foreign Languages)

One culture course of a contrastive nature

One of the following linguistics courses:

Linguistics 311—History of Spanish
Linguistics 313—Old Spanish
Linguistics 341—History of French
Linguistics 343—Old French
Linguistics 351—History of German
Linguistics 353—Middle High German
Linguistics 361—History of Russian Language
English 211—History of the English Language
English 310 or 311—Old English

- g. Other students may petition for another option which falls within the general guidelines but is not listed in a-f. A detailed plan must be submitted and approved by a committee appointed by the department chairperson.
- 5. All international students whose native language is not English must demonstrate proficiency in English. Proficiency may be demonstrated in either of the following ways:
 - a. TOEFL of 550 and TSE of 230
 - b. ACTFL oral proficiency rating of two and successful passing of a department English writing examination
- 6. Students choosing options a, b, or c must demonstrate proficiency in that language by achieving a 2+ oral proficiency rating and successfully passing the departmental writing examination in that language.
- 7. Students who choose options d, e, and f and whose native language is English must demonstrate proficiency in a second language using the criteria in section 6 or present four semesters or the equivalent of two foreign languages with at least a B average.
- 8. Students choosing option d whose native language is not English must demonstrate a higher level of English than that required in point five. English proficiency for those students may be demonstrated in one of the following ways:
 - a. TOEFL of 600 and TSE of 250.
 - b. ACTFL oral proficiency rating of 2+ and successful passing of the departmental advanced English writing examination.
- 9. If required courses are not offered during the time the student is enrolled, he/she may request permission to make appropriate substitutions. Students must declare the option they intend to follow at the time of their initial registration. Change in option can be made at student's request prior to the semester in which students take the written examinations.
- 10. A 3.00 GPA is required for graduation.
- 11. Demonstration of ability to undertake research and to write clearly and succinctly. The five possible options for fulfilling this requirement are listed in the departmental graduate student handbook.
- 12. Seven-hour written examination based upon the reading list. Student will have a reading list composed of seven sections. One may be drawn up by the student and the student's major adviser or selected from the master reading list. Candidates who write a thesis will have the number of sections (and hours of the examination) reduced to four. Five of the seven exams must be in the area of the student's option unless the student writes a thesis; in this case, three of the four must be in the option.
- 13. A one- to two-hour oral examination based upon course work and/or thesis.

All graduate assistants are required to complete Language Teaching Methods 421 as part of the work in the major fields unless they have had a similar course in their undergraduate study. The candidate's committee, together with the student, will determine the distribution of courses and the thesis requirement in the light of the student's aims and needs. The committee also will administer written and oral comprehensive examinations near the end of the candidate's course of study. Both oral and written examinations are normally given only twice a year, in November and in April.

Graduate assistants are required to enroll each semester in Lang. 490 and 499, although these credits do not count toward the master's.

Because of staff scheduling difficulties, students should not expect to have their committees available for the completion of work on their degrees for summer graduation.

A thesis, if chosen, must be submitted to the student's committee chairperson at least one month before the end of the enrollment period in which the student expects to complete all requirements for graduation. If this requirement is not met, thesis acceptance may be withheld for one semester.

An acceptable thesis proposal, including a problem statement, a thorough review of the literature, and an appropriate research design, is to be submitted to, and approved by, the student's committee before a thesis can be undertaken. Normally this proposal is submitted at least one semester before undertaking the writing of the thesis.

The thesis defense will be approximately one hour in length and is given after successful completion of the written examinations on elective master's reading list sections and the oral examination on course work.

One bound copy of the approved thesis is to be given to the Department of Foreign Languages upon completion of work for the degree.

Normally, the master's program requires four full semesters of study. Graduate assistants in particular should take this fact into account when planning their programs.

Special Courses of Study Abroad

Courses in German have been offered in Germany and Austria during the summer, in Spanish in Spain and Colombia during the summer, and in French in Canada during the summer and in France during the fall, spring, and summer. Students participating in a fall or spring semester abroad enroll for 15-18 semester hours of credit.

The Department of Foreign Languages offers a spring and a summer session in France and a summer session in Austria and in Spain or Colombia—contingent upon funding and faculty availability.

Bibliography and Research (Bibgy.)

301. *Introduction to Research.* I. 1-3 hr. (For seminar credit, counts as 1 hour; for a specific project carried out during the course, counts as 3 hours.) PR: Graduate standing. Pro-seminar in graduate-level research in foreign languages, literature, and linguistics.
365. *Methods of Research.* I. 3 hr.

Classics (Class.)

201. *Roman Novelists.* I. (Alternate Years.) 3 hr. PR: Class. 109, 110, or consent.
202. *Roman Comedy.* II. (Alternate Years.) 3 hr. PR: Class. 109, 110, or consent.
235. *Roman Epic.* I. 3 hr. PR: Class. 109, 110, or equiv.
292. *Pro-Seminar in Latin or Greek Literature.* 1-6 hr.* PR: Consent. Special topics.
392. *Seminar in Latin or Greek Literature.* 1-6 hr.* PR: Consent. Special topics.
397. *Master's Degree Research or Thesis.* I, II. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairperson and the professor teaching the course.

Foreign Literature in Translation (FLIT)

- 211. Chinese Literature in Translation. I. 3 hr. Survey of selected works of Chinese literature from ancient times through the eighteenth century.
- 221. Japanese Literature in Translation. II. 3 hr. Survey of selected works of Japanese literature from ancient period to the mid-nineteenth century and an introduction to a few works of the modern period.
- 292. Pro-Seminar. I, II, S. 1-6 hr.* PR: 6 hr. of upper-division literature courses or consent. Special topics.
- 392. Seminar. I, II, S. 1-6 hr.* PR: 6 hr. of upper-division literature courses or consent. Special topics.

French (Frch.)

- 203. Conversational French. I. 3 hr. PR: Frch. 110 or consent. Intensive spoken French.
- 217. French Civilization. II. 3 hr. PR: 12 hr. of French.
- 221. The Romantic Movement. I. 3 hr. PR: 18 hr. of French or consent.
- 222. French Realism. II. 3 hr. PR: 18 hr. of French or consent.
- 229. Literature of the Sixteenth Century. I. 3 hr. PR: 18 hr. of French or consent.
- 231. Phonetics and Pronunciation. II. 3 hr. PR: 12 hr. of French or equiv.
- 292. Pro-Seminar. I, II, S. 1-6 hr.* PR: 18 hr. of French or consent. Special topics.
- 305. Fundamentals for Reading French. I. 3 hr. PR: Graduate or upper-division standing. (Frch. 305 and 306 is intended for graduate students from other departments to teach them to read general and technical French.)
- 306. Reading French. II. 3 hr. PR: 12 hr. of French or equiv. or Frch. 305. (Graduate students may meet a doctoral foreign language requirement by achieving a grade of B or better in this course.)
- 326. Literary Criticism. II. 3 hr. PR: B.A. in French or consent.
- 337. Moliere. II. 3 hr. PR: B.A. in French or consent.
- 344. Explication de Textes. II. 3 hr. PR: 24 hr. of French or equiv.
- 371. The Modern Novel to 1930. I. 3 hr. PR: B.A. in French or consent.
- 372. The Novel After 1930. II. 3 hr. PR: B.A. in French or consent.
- 381. Medieval French Literature. II. 3 hr. PR: Lingu. 342 or consent.
- 391. Advanced Topics. I, II. 1-6 hr. PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.
- 392. Seminar. 1-6 hr.* PR: Consent. Special topics.
- 397. Master's Degree Research or Thesis. I, II. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairperson and the professor teaching the course.

German (Ger.)

- 243. *Medieval German Literature.* I. 3 hr. PR: 18 hr. of German or consent.
- 245. *Classicism and Romanticism.* I. 3 hr. PR: 18 hr. of German or consent. Critical study of German literature from 1750 to 1830.
- 246. *The Liberal Age.* II. 3 hr. PR: 18 hr. of German or consent. Critical study of German literature from 1830 to 1880.
- 247. *The Age of Crisis.* I. 3 hr. PR: 18 hr. of German or consent. A critical study of German literature from 1880 to present.
- 292. *Pro-Seminar.* 1-6 hr.* PR: Consent. Special topics.
- 301. *Independent Reading.* PR: Consent. I. 3 hr. Supervised reading for students who wish to do intensive work.
- 302. *Independent Reading.* II. 3 hr. PR: Ger. 301. Continuation of Ger. 301.
- 305. *Fundamentals for Reading German.* I. 3 hr. PR: Graduate or upper-division standing. (Ger. 305-306 is intended for graduate students from other departments to teach them to read general and technical German.)
- 306. *Reading German.* II. 3 hr. PR: 12 hr. of German or equiv. or Ger. 305. (Graduate students may meet a doctoral foreign language requirement by achieving a grade of B or better in this course.)
- 376. *The Modern Novel.* I, II. 3 hr. PR: 24 hr. of German or consent. A study of representative modern novels from 1900 to 1945.
- 391. *Advanced Topics.* I, II. 1-6 hr. PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.
- 392. *Seminar.* 1-6 hr.* PR: Graduate standing or consent. Special topics.
- 397. *Master's Degree Research or Thesis.* I, II. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

Language Teaching Methods (Lang.)

- 221. *The Teaching of Foreign Languages.* I. 3 hr. PR: Consent. Required of all students who are prospective foreign language teachers on the secondary level.
- 292. *Pro-Seminar.* I, II, S. 1-6 hr.* PR: Consent. Special topics.
- 391. *Advanced Topics.* I, II. 1-6 hr. PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.
- 392. *Seminar.* I, II, S. 1-6 hr.* PR: Consent. Special topics.
- 397. *Master's Degree Research or Thesis.* I, II. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.
- 421. *Teaching Foreign Language in College.* I, II. 1-6 hr.* Methods and techniques of teaching a foreign language at the college level.
- 490. *Teaching Practicum.* I, II, S. 1-3 hr.
- 499. *Graduate Colloquium.* I, II, S. 1-6 hr.* Required each semester of all graduate assistants in the Department of Foreign Languages.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairperson and the professor teaching the course.

Linguistics (Lingu.)

202. *Phonology*. I. 3 hr. PR: Lingu. 1, 111 or consent. Description of sounds and sound systems in language. Articulatory phonetics. Structural and generative approaches to phonetics.

217. *Structure of Spanish*. I. 3 hr. PR: 18 hr. of Spanish and Lingu. 111 or consent. Description of the phonological or grammatical systems of Spanish, with emphasis on contrastive analysis (Spanish/English) and applied linguistics.

247. *Structure of Modern French*. I. 3 hr. PR: 18 hr. of French and Lingu. 111 or consent. Study of phonology, morphology, and syntax of modern French together with a contrastive analysis of French and English.

257. *Structure of German*. II. 3 hr. PR: 18 hr. of German and Lingu. 111 or consent. Phonological, morphological, and syntactical structure of contemporary German language.

267. *Structure of Russian*. II. 3 hr. PR: 18 hr. of Russian and Lingu. 111 or consent. Phonological, morphological, and syntactical structure of contemporary Russian.

283. *Transformational Grammar*. S. 3 hr. PR: Lingu. 111 and consent. Emphasis on generative syntax in English, German, Romance, and Slavic languages.

284. *History of Linguistics*. I. 3 hr. PR: Lingu. 111 or consent. Development of linguistics from Greeks and Romans to contemporary researchers with concentration on major linguists and schools of the nineteenth and twentieth centuries.

287. *Psycholinguistics*. I. 3 hr. PR: Lingu. 111 or consent. Provides an insight into the many areas of psycholinguistics study, including language acquisition, sentence processing, animal communication, dichotic listening, aphasia, and semantics.

288. *Sociolinguistics*. I. (Alternate Years.) 3 hr. PR: Lingu. 1 or 111 or consent. Linguistic study of geographical and social variation in languages; effects of regional background, social class, ethnic group, sex, and setting; outcomes of conflict between dialect and between languages.

292. *Pro-Seminar*. 1-6 hr.* PR: Consent. Special topics.

311. *History of the Spanish Language*. II. (Alternate Years.) 3 hr. PR: 18 hr. of Spanish and Lingu. 111 or consent. Evolution of Castilian from Vulgar Latin to its modern standard form through a study of historical phonology, morphology, and syntax, together with the external factors which influenced the development of the language.

313. *Old Spanish*. II. 3 hr. PR: Consent.

341. *History of the French Language*. II. (Alternate Years.) 3 hr. PR: 18 hr. of French and Lingu. 111 or consent. Evolution of French from Vulgar Latin into the Modern French standard through a study of historical phonology, morphology, and syntax, together with the external factors which influenced the development of the language.

343. *Old French*. I. 3 hr. PR: Consent. Study of the oldest monuments of the French language including the *Chanson de Roland* and *Aucassin et Nicolette* in an effort to trace the evolution of Francien, Anglo-Norman, and Picard and Vulgar Latin.

351. *History of the German Language*. II. (Alternate Years.) 3 hr. PR: 18 hr. of German and Lingu. 111 or consent. Historical development of standard German with emphasis on its relationship to the other German languages and dialects.

*Variable credit courses normally carry three hours credit. Exceptions are made only in emergencies and must be approved by the department chairperson and the professor teaching the course.

353. *Middle High German* I. I. 3 hr. PR: 18 hr. of German and Ling. 111 or consent. Study of the linguistic developments of Middle High German from the eleventh to the fifteenth centuries with illustrative readings from the *Niebelungenlied*.

361. *History of the Russian Language*. II. (Alternate Years.) 3 hr. PR: 18 hr. of Russian and Ling. 111 or consent. Development of Russian from Indo-European to the present.

391. *Advanced Topics*. I, II. 1-6 hr. PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

392. *Seminar*. 1-6 hr.* PR: Consent. Special topics.

397. *Master's Degree Research or Thesis*. I, II. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

Russian (Russ.)

292. *Pro-Seminar*. 1-6 hr.* PR: 18 hr. of Russian or equiv.

Spanish (Span.)

221. *Golden Age Literature*. II. 3 hr. PR: 24 hr. of Spanish or consent. Consideration of Spanish literature of the Renaissance and the Counter Reformation with readings in the novel, the *comedia*, and lyric poetry.

223. *Estudios De Estilo*. I. 3 hr. PR: 18 hr. of Spanish or equiv.

224. *Introduccion a la literatura*. II. (Alternate Years.) 3 hr. A study of basic genres, themes, and techniques. Intensive reading of selected texts from various periods. Emphasis on Peninsular and/or Spanish American literature.

292. *Pro-Seminar*. 1-6 hr.* PR: Consent. Special topics.

315. *Lyric Poetry*. I. 3 hr. PR: 24 hr. of Spanish or equiv.

324. *Explicacion De Textos*. II. (Alternate Years.) 3 hr. PR: 24 hr. of Spanish or equiv.

325. *The Picaresque Novel*. I. 3 hr. PR: 24 hr. of Spanish or equiv.

391. *Cervantes*. II. 3 hr. PR: 24 hr. of Spanish or consent.

392. *Seminar*. 1-6 hr.* PR: Consent. Special topics.

395. *Sixteenth Century Literature*. I. 3 hr. PR: B.A. in Spanish or consent.

397. *Master's Degree Research or Thesis*. I, II. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

*Variable credit courses normally carry 3 hr. credit. Exceptions are made only in emergencies and must be approved by the department chairperson and the professor teaching the course.

FOREST RESOURCES SCIENCES

Jack E. Coster, Chairperson of Division of Forestry
322-A Percival Hall

Norman D. Jackson, Assistant Chairperson

David E. Samuel, Coordinator of the Graduate Program

Degree Offered: Doctor of Philosophy in Forest Resources Sciences

Graduate Faculty: Members Armstrong, Brock, Brown, Hassler, Hicks, Margraf, Michael, Patterson, Perry, Samuel, Smith, Tajchman, White, Wiant, and Whitmore.
Associate Members Coster, Jackson, Kidd, and Yandle.

Doctor of Philosophy in Forest Resources Sciences

A candidate for the doctor of philosophy degree in forest resources science in the College of Agriculture and Forestry may choose as the major field of study forest science, wood science, or wildlife management. Within these major fields of study, specialization is limited only by the range of competencies in the graduate faculty.

Curriculum requirements of all candidates include a block of graduate courses in the major field which will constitute a comprehensive review of the significant knowledge in that field, and a block of graduate courses in a minor area of study. A minimum of 60 semester hours beyond the bachelor's degree and exclusive of the dissertation will be required.

The research work for the doctoral dissertation must show a high degree of scholarship and must present an original contribution to the field of forest resources science. In addition to course work and the dissertation, the candidate is required to pass a qualifying examination and a final examination.

Admission requirements include a minimum grade-point average of 3.0 during the last years of undergraduate studies, a master's degree, a minimum total score of 1,200 on the verbal and quantitative portions of the Graduate Record Examination, three letters of recommendation, submission of copies of previous publications, at least a 600-word composition indicating the student's purpose and objective in undertaking graduate studies as related to major issues in that area, and an acceptable TOEFL score if a foreign student.

Forest Management (F. Man.)

411. *Advanced Forest Ecology*. I. 3 hr. PR: F. Man. 12 or equiv.; F. Man. 211. Ecological relationships in forests with emphasis on biogeochemical cycles.
412. *Silvicultural Practices for Hardwood Forest Types*. II. 3 hr. PR: F. Man. 211. Designing proper silvicultural systems for managing Appalachian hardwood stands; reconstructing stand histories, recognizing problems, and prescribing appropriate silvicultural treatment.

Wood Science (Wd. Sc.)

473. *Seminar in Wood Utilization*. II. 1 hr. per sem.; max. credit, 4 hr. PR: Consent. Reports and discussions of recent research in fundamental and applied phases of wood utilization.

FORESTRY

Jack E. Coster, Chairperson of Division of Forestry
322-A Percival Hall

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Degree Offered: Master of Science in Forestry

Graduate Faculty: Members Armstrong, Brock, Brown, Hassler, Hicks, Margraf, Michael, Patterson, Perry, Samuel, Smith, Tajchman, White, Wiant, and Whitmore. Associate Members Coster, Jackson, Kidd, and Yandle.

Master of Science in Forestry (M.S.F.)

Admission requirements are those of the College of Agriculture and Forestry. Additionally, students seeking admission for the degree of master of science in forestry (M.S.F.) should have completed an undergraduate curriculum in forestry. A student whose undergraduate degree is in a field other than forestry will ordinarily be required to take supplemental undergraduate courses. Candidates for the degree may major in forest biometry, forest ecology, forest economics, forest genetics, forest meterology, forest management, silviculture, or wood industry. The candidate must complete 30 hours of approved study, 6 hours of which shall constitute a thesis. The program ordinarily requires two years of residence.

Forestry (For.)

- 220. *Forest Policy and Administration.* I and II. 3 hr. PR: Upperclass forestry major or consent. Forest policy in the United States; important federal and state laws; administration of public and private forests; problems in multiple-use forestry.
- 226. *Remote Sensing of Environment.* II. 2 hr. PR: Math. 3, 4. Measurement and interpretation of natural resources and environment from photography, radar, infrared, and microwave imagery.
- 233. *Principles of Industrial Forestry.* I. 3 hr. PR: Forestry senior or consent. Analysis and case studies of problems pertinent to the integration of wood conversion technology with principles of production, marketing, and management.
- 310. *Biometeorology.* II. 4 hr. PR: Consent. A description of the physical environment of plants and its effect on growth, its modification for increasing yield and for plant protection against extreme atmospheric conditions.
- 410. *Biophysical Ecology.* I. 3 hr. PR: For. 310 or consent. An analysis of interactions of plants and animals with their environment based on principles of environmental physics. Energy and mass exchange between plants and animals, and their environment; environmental variables and organism parameters. (Offered in Fall of even years.)
- 419. *Microclimatology.* II. 3 hr. PR: Consent. A description and quantitative treatment of climate near the ground in terms of physiological processes of energy and mass exchange.
- 470. *Special Topics in Forestry, Wood Science, Wildlife, or Recreation.* I, II, S. 1-6 hr.
- 480. *Principles of Research.* I. 2 hr. The specific method as applied in the formal, concrete, and normative sciences, with special emphasis on forestry-related research plans and reports.
- 490. *Teaching Practicum.* I, II. 1-6 hr. PR: Consent. Supervised practices in college teaching of forest resources management, wood science, wildlife management resources, and recreation and parks.

- 491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled classes.
- 497. *Research.* I, II, S. 1-15 hr.
- 498. *Thesis.* I, II, S. 1-6 hr. PR: Consent.
- 499. *Graduate Colloquium.* I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet resident requirements, use the University's facilities, and participate in its academic and cultural programs.

Forest Hydrology (F. Hyd.)

- 243. *Forest Water Quality.* I. 3 hr. PR: Forestry major or consent. (This course will not substitute for F. Hyd. 244.) Influences of natural forest cover, forest land uses, and harvesting practices on selected water quality parameters that can be detected in simple field and laboratory tests.
- 244. *Watershed Management.* II. 3 hr. PR: F. Man. 12, 211. (Primarily for forest management majors.) Influences of silvicultural practices and forest management activities on the hydrology of forested catchments.

Forest Management (F. Man.)

- 200. *Forest Measurement, Interpretation, Wildlife Management.* S. 5 hr. PR: Biol. 51; C.E. 5; F. Man. 122. (Course will be taught during four consecutive 6-day weeks.) Application and study of forest resources practice with emphasis on field problems.
- 201. *Forest Resources Management Southern Trip.* S. 1 hr. PR: F. Man. 200 or consent. One-week trip to the Southern Pine Region to observe forest management practices on private and public lands.
- 211. *Silvicultural Systems.* I. 4 hr. PR: Forestry major or consent; F. Man. 12. Principles of regeneration cuttings, intermediate cuttings, and cultural operations, with their application to forest stands.
- 213. *Regional Silviculture.* I. 2 hr. PR: Forestry major or consent. F. Man. 12; PR or Conc.: F. Man. 211. Major forest types of the United States: their composition, management, problems, and silvicultural treatment.
- 215. *Principles of Artificial Forestation.* II. 3 hr. PR: Forestry major or consent; F. Man. 12. Seeding and planting nursery practice; phases of artificial regeneration.
- 216. *Forest Genetics and Tree Improvement.* II. 3 hr. PR: Forestry major or consent; Gen. 272 or equiv., or consent. Forest genetic principles and their application to forest tree improvement, including crossing methods, selection systems, and other techniques.
- 222. *Advanced Forest Mensuration.* II. 3 hr. PR: Forestry major or consent; F. Man. 122. Measurement of growth and yield; statistical methods applied to forest measurement problems.
- 230. *Principles of Forestry Economics.* II. 4 hr. PR: Econ. 54 and 55 or equiv. Production, distribution, and use of forest goods and services. Emphasis on analytical methods and problem solving techniques in the economic aspects of forestry.
- 233. *Forest Management.* I. 4 hr. PR: Summer Camp; PR or Conc.: Forestry major or consent; F. Man. 211. Principles of sustained yield forest management. Organization of forest areas, selection of management objectives, application of silvicultural systems, and regulation of cut. Forest management plan.
- 234. *Forest Resources Management Planning.* I, II. 3 hr. PR: Forestry major or consent; senior standing. Analysis and planning for management of forest resources. Development of a management plan for an actual forest tract.
- 330. *Advanced Principles of Forestry Economics.* II. 3 hr. PR: Econ. 51, 52 or equiv.; F. Man. 230 or equiv. Intensive study of both micro- and macroeconomics of forestry.

Wood Science (Wd. Sc.)

- 200. *Forest Measurement Field Practice.* S. 3 hr. PR: Wood Industry major, Biol. 51, C.E. 1, F. Man. 122. Application of surveying and mensurational practices with emphasis on field problems.
- 201. *Wood Industries Field Trip.* S. 1 hr. PR: Wd. Sc. 134. A one-week trip to observe manufacturing methods and techniques of commercial wood industry plants. Plants visited include furniture, plywood, veneer, hardboard, particle board, pulp and paper, sawmilling, and preservation.
- 213. *Wood Chemistry.* I. 3 hr. PR: Wood Industry major or consent; Chem. 131 or 133. Chemical composition of wood including cellulose, hemicellulose lignin and extractives. Chemical processing of wood.
- 230. *Wood Machining.* I. 2 hr. PR: Consent. Introduction to basic concepts of wood machining with emphasis on production equipment and furniture manufacturing.
- 234. *Statistical Quality Control.* I. 3 hr. PR: Forestry major or consent; Wd. Sc. 134. Methods used to control quality of manufactured wood products. Control charts of variables and attributes. Acceptance sampling techniques.
- 235. *Light-Frame Wood Construction.* I. 2 hr. PR: Forestry major or consent. Use of wood in light-frame construction. Basic design procedures and construction methods.
- 237. *Wood Adhesion and Finishing.* II. 3 hr. PR: Wood Industry major or consent; Wd. Sci. 123 and 141. Fundamentals of the bonding and finishing of wood including preparation, processing, and evaluation of adhesive and finishing systems.
- 240. *Wood Moisture Relationships.* II. 3 hr. PR: Wd. Sc. 123. Principles involved in the relation between wood and moisture, and purposes, effects, and methods of seasoning.
- 251. *Forest Products Protection.* II. 3 hr. PR: Wd. Sc. 123, 134. Biological organisms responsible for deterioration of wood products, their control by preservative methods, and study of fire retarding methods.
- 260. *Plant Layout for Wood Industries.* II. 3 hr. PR: Senior standing. Relates knowledge of wood to industrial wood product processes to optimize production. Study of proper arrangement of machines, and work and storage areas.
- 262. *Forest Products Decision-Making.* I. 3 hr. PR: Junior standing in Forestry. Decision-making tools and techniques used by the forest products industry such as simulation linear programming, network analysis, forecasting, game theory.
- 320. *Wood Microstructure.* I. 3 hr. PR: Wd. Sc. 123; senior standing. Detailed examination of wood microstructure as it relates to processing, behavior, and identification.
- 340. *Advanced Physical Behavior of Wood.* I. 3 hr. PR: Wd. Sc. 240 or equiv. or consent. Physical relationships of water and wood; fluid flow through wood; thermal, electrical, and acoustical behavior of wood. Theories of wood drying and their application.
- 362. *Forest Products Operations Research Models.* II. 3 hr. PR: Wd. Sc. 262 and demonstrated knowledge of Fortran and Basic, or consent. Analysis of operations research models currently used by the forest products industry. Students will develop new models. (Offered in Spring of even years.)
- 473. *Seminar in Wood Utilization.* II. 1 hr. per sem.; max. credit, 4 hr. PR: Consent. Reports and discussions of recent research in fundamental and applied phases of wood utilization.

GENETICS AND DEVELOPMENTAL BIOLOGY

Joginder Nath, Chairperson of the Interdisciplinary Faculty

1120 Agricultural Sciences Building

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Blaydes, R. L. Butcher, L. Butler, Caterson, Charon, Gallagher, Garbutt, Gerencser, Kaczmarczyk, Katula, Keller, Klandorf, Kotarski, Leonard, McGraw, Mengoli, Miller, Nath, Ong, Overman, Pore, Quinlan, Reyer, Sheil, Strobl, Thayne, Tryfiates, Van Dyke, Vrana, Wearden, Williams, and Yelton. Associate Members D. F. Butcher, Hall, Kirk, Montiegel, and Ulrich.

The M.S. and Ph.D. degrees are offered in genetics and developmental biology, an interdisciplinary program involving the faculty and facilities of a number of departments in the various colleges and schools of the University. A student may concentrate in genetics or developmental biology. The areas in which specialization is offered are as follows:

Genetics—Biochemical and molecular genetics, cytogenetics, developmental genetics, immunogenetics, mutagenesis, toxicology, human genetics, plant genetics, population and quantitative genetics, and animal breeding;

Developmental Biology—Molecular aspects of development, experimental morphogenesis, teratology, regeneration, oncology, descriptive embryology, and life cycles of animals and plants.

The student may also minor in one or more other scientific fields. Students are expected to maintain at least a 3.0 (B) average in all work offered in fulfillment of the degree program. For a more complete statement of requirements, the student is referred to the program's *Guidelines for Graduate Students in the Genetics and Developmental Biology Program*. The chairperson for the genetics and developmental biology program is housed in the College of Agriculture and Forestry.

The objective of this program is an increased level of understanding of modern concepts and methodologies employed in genetic and developmental biological work and to prepare a student to pursue a career in teaching and/or research. Responsibility for a student's program is vested in a graduate committee charged with arranging the student's course work, conducting examinations, and supervising the research.

To be considered for admission in the program the student must possess a baccalaureate degree from an accredited college or university, must have a grade-point average of at least a 2.75 (on a 4.0 scale), or an average of 3.0 or higher for the last 60 credit hours or an average of 3.0 or higher in all courses in sciences and mathematics.

The student must submit the scores of the Graduate Record Examination (GRE), or the New Medical College Admission Test (New MCAT). The student must provide three letters of reference from persons acquainted with the applicants' professional work, experiences, or academic work and submit a written statement of 500 words or more indicating the applicants' goals and objectives relative to receiving a graduate degree.

Basic training in mathematics, physics, chemistry, and biology is required for admission. Students lacking prerequisites may be accepted in a provisional status but must fulfill them before graduation. Applications for graduate study should be sent in as early in the year as possible, but not later than April 1 for entry the following August. However, applications are accepted year-round for admission to the program in the following semester. Official transcripts of baccalaureate and/or master's degrees must be sent directly to the WVU Office of Admissions and Records. Application forms can be received from the WVU Office of Admissions and Records, P.O. Box 6009,

Morgantown, WV 26506-6009. For further information, write to the Chairperson.

Genetics (Gen.)

290. *Crop Breeding*. II. 3 hr. PR: Gen. 171 or 321. Methods and basic scientific principles involved in improvement of leading crops through hybridization, selection, and I. Control of phenotype by genetic material. Gene action and coding of genetic material.

325. *Human Genetics*. II. 3 hr. PR: Gen. 171 or 321 or consent. Study of genetic system responsible for development of phenotype in man. (Offered in Spring of odd years.)

335. *Population Genetics*. II. 3 hr. PR: Gen. 171 or 321 or consent. Relationship of gene and genotype frequencies in populations of diploid organisms, and the effects of mutation, migration, selection, assortive mating, and inbreeding in relation to single gene pairs. Application of these concepts to multigenic inheritance of quantitative traits. (Offered in Spring of even years.)

370. *Medical Genetics*. II. 2-4 hr. PR: Second-year medical student standing; graduate student in Genetics and Developmental Biology; others by consent. Introduction to clinical genetics including molecular, biochemical, and cytogenetic aspects of human biology. Application of genetic principles to human health and disease. (Also listed as CC MD 370, Med. 370, Pedia. 370.)

424. *Cytogenetics*. II. 4 hr. PR: Gen. 171 or 321, and Biol. 215 or consent. Emphasis on macromolecules that carry information of the chromosomes, cell division, and the cytological and molecular basis of genetics. Special attention given to visible manifestation of genes, human cytogenetics, cytogenetics of genomes and chromosome morphology, and their evolution. (Offered in Spring of odd years.)

426. *Advanced Biochemical Genetics*. II. 3 hr. PR: Gen. 171 or 321 and organic chemistry. Physiological and biophysical concepts of genetic material. Structure and arrangement of genetic units. Nucleic acids as carriers of genetic information. Gene action and amino acid coding. Biochemical evolution of genetic material. Genetic control mechanisms. Biochemistry of mutation. (Offered in Spring of even years.)

427. *Genetic Mechanisms of Evolution*. I. 3 hr. PR: Gen. 171 or equiv. Molecular genetic mechanisms which result in evolutionary change. Origin of life, origin and organization of genetic variability, differentiation of populations, isolation and speciation, role of hybridization and polyploidy, and origin of man. (Offered in Fall of odd years.)

450. *Seminar*. I, II. 1 hr. per sem. Recent literature pertaining to biochemical, classical, human, molecular, and cytological genetics.

497. *Research*. I, II. 1-15 hr.

Developmental Biology

The following courses in the Departments of Anatomy, Biochemistry, and Biology may be applied toward the requirements for a major in developmental biology: Anatomy 402—Advanced Developmental Anatomy, Anatomy 405—Experimental Embryology, Biochemistry 491—Advanced Study in Nucleic Acids, Biology 214—Molecular Basis of Cellular Growth, Biology 309—Molecular Biology of the Gene, Biology 362—Developmental Biology, and Biology 364—Advanced Plant Physiology.

GEOGRAPHY

Robert Hanham, Assistant Chairperson of Department of Geology and Geography
406 White Hall

Degree Offered: Master of Arts

Graduate Faculty: Members Calzonetti, Elmes, Hanham, T. Harris, Kite, Martis, Pickles, and Pyle.

The graduate program in geography at WVU provides students with the opportunity to study for an M.A. degree in one of three areas of specialization: (1) regional development and planning; (2) energy and environmental resources; (3) geographic information systems and cartographic analysis. Students who are interested in pursuing research in an area other than these may do so provided the research area matches the interests of a faculty member in the department who agrees to supervise the student's program. Students who wish to focus their research on a particular region are encouraged to do so. Faculty in the geography program currently have research interests in Appalachia, North America, Africa, Europe, the Middle East, and the Pacific.

The award of an M.A. in Geography requires: (1) 30 hours of graduate credit with a minimum grade-point average of 3.0; (2) satisfactory completion of Geography 300 (Geography Research Colloquium, four credits), Geography 301 (Geographic Theory and Practice, three credits), Geography 302 (Research Design, three credits), Geography 399 (Geostatistics and Quantitative Methods, three credits), and four credit hours of Geography 496 (Graduate Research Seminar); (3) satisfactory completion of at least 21 graduate credit hours in geography, of which the 17 listed in (2) immediately above may be included; (4) a successful oral examination of the student's knowledge of the literature in the student's field of specialization and in the philosophy of geography; and (5) completion and successful oral defense of a research thesis.

Prospective students should have an overall undergraduate grade-point average of 2.75, and 3.0 GPA for geography courses. Students with degrees in other disciplines are encouraged to apply, but they may be asked to make up deficiencies in geography during their first year in the program. Incoming geography students may also be asked to make up deficiencies if such are found to exist during the students' entry interview with faculty immediately prior to the first semester of their program. Applicants for the program should submit GRE scores, or equivalent qualification, and three letters of reference, and official transcripts.

Each incoming student is interviewed prior to the first semester of his or her program. The purpose of this meeting is threefold: to introduce the student to the faculty; to ascertain the student's interests; and to assess whether the student has deficiencies that should be rectified. Students with well-defined interests are assigned an adviser at this time. Other students are supervised by the Director of the Graduate Program until the student develops a more clearly defined research interest, which should be no later than the end of the student's first year in the program. At the end of this year, at least two further faculty will be assigned to each student to form the student's program committee. At least one of these must be a geography faculty member at WVU. Students may change advisers or committee members after consultation with the adviser, the Director of the Graduate Program, and the Director of the Geography program.

Students are expected to choose an area of specialization within the first semester of their program of study. This choice will determine which courses the student shall take. In each area, the student is encouraged to take courses

both in geography as well as outside the discipline. In general it is expected that a student's program will have the following format:

First Semester, First Year

- Geog. 300—Geography Research Colloquium (1 hr.)
- Geog. 301—Geographic Theory and Practice (3 hr.)
- Geog. 496—Graduate Seminar in Geography (2 1-hr. modules)
- Three credit hours of directed readings or graduate course.

Second Semester, First Year

- Geog. 300—Geography Research Colloquium (1 hr.)
- Geog. 302—Geographic Research Design (3 hr.)
- Geog. 399—Quantitative Methods in Geo-Sciences (3 hr.)
- Geog. 496—Graduate Seminar in Geography (2 1-hr. modules)

First Semester, Second Year

- Geog. 300—Geography Research Colloquium (1 hr.)
- Eight credit hours of directed readings or graduate courses

Second Semester, Second Year

- Geog. 300—Geography Research Colloquium (1 hr.)
- Two or more credit hours of thesis research.

All students shall be examined no later than the end of their third semester on their knowledge of the literature in their area of specialization and in the philosophy of geography. The examination shall be oral and it will be conducted by the student's committee. The student shall pass the examination if at least two-thirds of the committee vote in favor of a pass. Should the student fail the examination, either the student shall be required to undertake some remedial study, such as a course or directed readings which must be completed with at least a B grade, or the student will be required to retake the examination. No student may retake the examination more than once.

The thesis will represent the outcome of independent research undertaken by the student. It must be regarded by the student's program committee as a contribution to the discipline of geography. The thesis must also reflect the student's knowledge of the literature pertaining to the subject matter of the thesis. A student may substitute a thesis of a special nature with the approval of the faculty; e.g. policy document, film, and so on. A full proposal regarding the thesis research will be presented to the faculty in an oral presentation no later than the end of the third semester of the student's program of study. The student's committee will determine the proposal's acceptability. If it is deemed unacceptable, a further presentation may be required. The proposal must be typed and copied and submitted to the committee at least two weeks prior to the presentation. The defense of the thesis will take place when the student and his/her committee agree that a defensible copy of the thesis is complete. For full-time students this shall be no more than three years after entry into the program. The examination is graded on a pass/provisional-pass/fail basis by a majority vote of the committee. A student who fails may submit another thesis or a revised version of the existing one upon the approval of the student's committee. No student shall be re-examined more than once. A student who is given a provisional pass will generally be required to make minor revisions or corrections to the thesis.

It is expected that full-time students shall not need more than two years to satisfy all program requirements. In many cases these can be fulfilled in less time than that.

Research and teaching assistantships are awarded on an annual basis and for no more than two years. Awards for the second year are based on performance in the first year with respect to both assistantship duties and academic progress. Assistantships include a full tuition waiver.

The graduate program in geography at WVU has strong liaison with the University's Geology Program, the Regional Research Institute, the Department of Mineral Resource Economics, Water Research Institute, International Studies Program, West Virginia Geological and Economic Survey, and with several other units in the University. Contemporary high-speed computing facilities are centered on a DEC cluster for geographic information systems and analysis. The system has three gigabytes of on-line storage, tape drives and supports Tektronix graphic workstations, digitizers and plotters for cartographic output. Major hardware upgrades are scheduled for 1989-1990. ARC-INFO geographic information system operates in a multi-user environment. ERDAS image-processing/GIS and GRASS are installed on personal computers, 286, 386 and MACIIs, also run cartographical and statistical applications. The department computer system is linked to WVNET mainframe installations for access to all major software and to electronic networks.

Geography (Geog.)

- 200. *Geography Data Analysis.* I. 3 hr. Quantitative techniques for collection, classification, and spatial analysis of geographical data with emphasis on map analysis and application of spatial analysis.
- 201. *Geography of West Virginia and Appalachia.* II. 3 hr. PR: Geog. 8. Analysis of changing patterns of human use of the physical environment in West Virginia and Appalachia.
- 202. *Political Geography.* II. 3 hr. Examines the interrelationship between politics and the environment, human territoriality, the political organization of space, geopolitical aspects of the nation-state and international problems.
- 205. *Environmentalism in the United States.* II. 3 hr. Surveys natural resource exploitation and environmental alteration in the United States from the beginning of European settlement, with consideration of changing natural resources, conservation, and environmental perceptions and policies.
- 209. *Industrial Location.* II. 3 hr. PR: Geog. 109 or consent. Applied theoretical aspects of location decisions in primary, secondary, and tertiary activities. Emphasis will be on the understanding of location patterns and the impact of industries on other characteristics of communities.
- 210. *Global Issues: Inequality and Interdependence.* II. (Alternate Years.) 3 hr. PR: Geog. 1 or 2 or 8. Themes of spatial equity and justice in an increasingly interdependent world system. Contemporary issues concerning location, place, movement, and region.
- 211. *Regional Development.* 3 hr. PR: Geog. 109 or consent. Examination of growth and decline of regions in developed countries, with emphasis on the United States. Practical implementation of regional development policies. 3 hr. lec.
- 219. *Problems in Geography.* I, II. 1-9 hr. PR: Consent. Independent study or special topics.
- 220. *Seminar in Geography.* I, II. 1-9 hr. per sem.; max. 15 hr. PR: Consent. Includes separate seminars in urban, economic, physical, behavioral, social, Appalachian, transportation, census, planning, resource, international studies, geographic model building, rural problems, cartography, aging and environment, and energy.
- 221. *Geomorphology.* II. 3 hr. PR: Geol. 1 or 5. (Optional field trip at student's expense.) An examination of the physical processes which shape the surface of the earth, with emphasis on fluvial processes and environmental geomorphology. (Also listed as Geol. 221.)

225. *Urban and Regional Planning*. II. 3 hr. PR: Geog. 110 or Pol. S. 121 or consent. Explores concepts, techniques, and processes of physical and socio-economic planning and their application to urban and regional problems.

230. *Rural Land Use*. I. 3 hr. PR: Geog. 8. Analysis of the geographic distribution of various land uses in rural areas.

235. *Place and Behavior*. (Alternate Years.) 3 hr. PR: Geog. 8. Changing experience of geographical space over the life cycle as reflected in activity patterns, territoriality, and environmental images; traces environmental design of schools, nursing homes, parks, and shopping malls.

251. *Geographic Informational Systems Technical Issues*. (Alternate Years.) 3 hr. PR: Geog. 151 and Geog. 200. Operational and management issues in planning management analysis, locational decision making and design and implementation of GIS. Lab project emphasizes student's specialization. (2 hr. lec., 1 hr. lab.)

252. *Geographical Informational Systems Applications*. (Alternate Years.) 3 hr. PR: Geog. 151 and Geog. 200. Operational and management issues in planning management analysis, locational decision making and design and implementation of GIS. Lab project emphasizes student's specialization. (2 hr. lec., 1 hr. lab.)

261. *Cartography*. I, II. 3 hr. An introduction to mapping, including historical developments, coordinate systems, projections, generalization, symbolization, map design, computer-assisted cartography, landform representation, and data manipulation for dot, graduate symbol, chloropleth, and isarithmic mpas.

262. *Cartographic Techniques*. II. 3 hr. PR: Geog. 261 or consent. Advanced map construction including positive and negative artwork, darkroom techniques, color and color proofing, and map reproduction.

285. *Methods of Geographic Research*. II. (Alternate Years.) 3 hr. PR: Consent. Geographic analysis as problem-solving activity. Practical experience in field techniques, library research, hypothesis formation and testing, and report preparation and presentation. Students will acquire skills in literary and numerical approaches to geographic data analysis.

290. *Geographical Perspectives on Energy*. II. 3 hr. PR: Consent. A survey of the distribution of finite, renewable, and continuous energy resources and an investigation of the geographical patterns of energy consumption and energy flows. The policy implications of an unequal distribution of energy are evaluated.

295. *Internship*. I, II, S. 1-12 hr. PR: Junior standing and consent. A working internship with an agency or company designed to give the student experience in the practical application of geographic training to specific problems.

299. *Honors Thesis*. I, II, S. 3-6 hr. PR: Departmental consent. Thesis proposal, writing, and defense for students admitted to the Honors Program.

300. *Geography Research Colloquium*. I, II. 1 hr. PR: Consent. Lectures and presentations on recent and current research by resident and visiting scholars.

301. *Theory and Philosophy of Geography*. 3 hr. PR: Geog. 285 or consent. Development and significance of concepts and theories in geographical traditions; introduction to current research interests and specialties of the program.

302. *Geographic Research-Design*. II. 3 hr. PR: Geog. 200 and Geog. 301. Choosing, preparing, and developing research problems of geographic interest. Emphasizes proposal writing and research design alternatives.

310. *U.S. Regions in World-Economy*. II. (Alternate Years.) 3 hr. PR: Geog. 8 and 109, or consent. An examination of the growth and decline of regions in the United States, with particular emphasis on the regional impact of the United States' changing involvement in the world economy.

311. *Advanced Regional Development*. 3 hr. PR: Geog. 211 or consent. Review of geographic theories in developed countries; comparison of development policies in capitalist and socialist countries. 3 hr. lec.

315. *Underdeveloped Regions*. II. (Alternate Years.) 3 hr. PR: Geog. 8 and 109, or consent. Underdevelopment of various regions throughout the world, including a critical assessment of recent national and international development policies.

329. *Problems in Geomorphology*. I, II. 1-4 hr. (Also listed as Geol. 329.)

399. *Advanced Research Methods*. 3 hr. PR: Stat. 311, Geog. 200 or consent. Brief review and introduction to multivariate quantitative techniques as applied to geology and geography. (Also listed as Geol. 399.)

489. *Geography Graduate Student Internship*. I, II, S. 1-6 hr. PR: Consent. Internship in the private or public sector designed for practical application of geographic training.

491. *Advanced Study in Geography*. I, II, S. 1-6 hr. Investigation of topics not covered in regularly scheduled courses. Study may be independent or through scheduled meetings.

496. *Graduate Seminar in Geography*. I, II, S. 1-6 hr. Research seminars in energy studies, regional science, regional development and planning, water resource and environmental management, geomorphology, area studies, advanced geostatistics, and computer analysis.

497. *Research in Geography*. I, II, S. 1-6 hr.

GEOLOGY

Alan C. Donaldson, Chairperson of Department of Geology and Geography
425 White Hall

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Donaldson, Gillespie, R. Harris, Heald, Kammer, Lang, Rauch, Renton, Shumaker, Smosna, and Wilson. Associate Member Behling.

The Department of Geology and Geography offers work leading to the degrees of master of science (M.S.) and doctor of philosophy (Ph.D.) in geology.

Applicants for graduate studies in geology must have as a minimum requirement a bachelor's degree and an overall grade-point average of at least 2.75. Acceptance by the Department of Geology and Geography is necessary before admission of any prospective student to the program. All candidates for a graduate degree in geology must submit scores in the general aptitude test of the Graduate Record Examination.

Before being admitted to programs leading to the M.S. or the Ph.D., a student must pass an entrance examination covering physical, historical and structural geology, sedimentation-stratigraphy and mineralogy. The examination is given from 7:00-9:30 p.m. on the second day of classes each semester.

Students seeking admission to the master's program or the Ph.D. program must complete the equivalents of all science and mathematics courses required for the B.S. in geology at WVU before being admitted to these programs.

In the descriptions that follow, "formal course" means a lecture or seminar course and not a directed, but independent, exercise in the solution of a specific problem and the presentation of results.

A minimum grade-point average of 3.0 must be maintained in required formal courses in geology and cognate fields for the masters degree and 3.3 for the Ph.D. Credit will not be allowed for courses in which grades below "B" are attained, but these courses will be included in the grade-point average. Loads of 9-12 hours are required and no withdrawals are permitted after the first two weeks of a semester. A student who fails to maintain the required average at the completion of any semester during the graduate program will be allowed one academic year (two semesters) to attain the required average.

Failure to attain this average by the end of the probationary period will permanently eliminate the student as a candidate for a graduate degree in this department.

Master of Science (M.S.)

No later than the beginning of the second semester in residence, the prospective candidate must choose one of the options leading to the master of science (M.S.) degree in geology.

Option One: Master of Science in Geology (M.S.)—Research

This has been the "traditional" option for the master of science in geology. Students considering continued studies (doctor of philosophy) should choose this option.

A minimum of 24 formal-course hours with grades of A or B and six research hours are required for graduation. A thesis based on original research also is required. With consent of the candidate's advisory committee, the field work need not be done while in residence at WVU.

Required to Graduate: 30 hours, including certain required courses specified by the adviser.

Option Two: Master of Science in Geology (M.S.)—Professional Studies

This option is designed specifically for students seeking experience in preparing and presenting professional problems. Students choosing this option would be seeking employment in technical fields rather than continuing studies for a higher degree.

A minimum of 34 formal-course hours with grades of A or B and eight problems hours (Geol. 492) are required for graduation. The problems hours are in lieu of a thesis and are designed to simulate the work of professional geologists as they seek solutions to open-ended problems. Experience in presentation of problems and solutions is an integral part of the program.

Problems credits may be earned in conjunction with off-campus experiences by consent of the candidate's advisory committee.

Required to Graduate: 42 hours, including certain required courses specified by the adviser.

Doctor of Philosophy (Ph.D.)

The candidate for the doctor of philosophy (Ph.D.) must complete a program of courses outlined by the candidate's doctoral committee. Reading competence in a foreign language is required. Written and oral comprehensive examinations must be successfully completed. Work on original research is to be presented in a dissertation and defended in an oral examination.

Research

Close cooperation between the West Virginia Geological and Economic Survey, located on Cheat Lake near Morgantown, and the Department of Geology and Geography makes a large amount of material available for laboratory investigation. This includes the fossil collections of the department and the survey. A large number of samples of drill cuttings from deep wells in West Virginia and adjoining states are housed in the survey. Complete analytical geochemical equipment is available through a University analytical laboratory available to the department. The department also has a number of cooperative projects with the Morgantown Energy Technology Center of the U.S. Department of Energy. Morgantown is conveniently situated for detailed studies of Mississippian, Pennsylvanian, and Permian formations. Mineral

products of the region near Morgantown include coal, petroleum, natural gas, and limestone. The occurrence and utilization of these materials can be studied by graduate students interested in economic geology. Department geophysical equipment includes a Geometrics magnetometer, a Worden gravimeter, an engineering seismograph, and a three-component short period seismograph. A permanent summer field camp (Camp Wood) is located in the Folded Appalachians at Alvon, Greenbrier County. The coastal geology program includes an annual trip to the Florida Keys, and the Virginia shore. Other summer field courses are carbonate sedimentation in the Florida Keys, glacial geology in Maine, and a biennial European geology at different sites. Additional oceanography courses and research are available at the Marine Science Consortium at Wallops Island, Virginia, with which WVU is affiliated.

The Department computer facility operates in a clustered microVAX environment, consisting of a VAX 11/750, five VAX 2000/3100 workstations and a VAX 3500 workstation with an attached Sky Warrior array processor. Seismic modeling software includes GeoQuest International Incorporated's interactive AIMS III (advanced interpretive modeling system), and Oklahoma Seismic Corporation's MIRA interactive seismic modeling software are available. Forward and inverse algorithms are available in Interpex Ltd. for model studies of gravity, magnetic resistivity, and electromagnetic data. The Kansas Geological Survey's SURFACEII well log data contouring and statistical analysis package is also available for use on VAX workstations along with Scientific Computer Application Inc.'s MCS mapping and contouring system which operates on a PC. An interactive database management system has been developed and interfaced with SURFACEII to facilitate updating, sorting and plotting of selected data. Additional software include: VAX/VMS Fortran 77, SAS statistical package, NTSYS numerical taxonomy system, DECnet networking, JCDPS Powder diffraction search/match, INFORMAP CAD/AM/FM, EMIS GIS, and IEMIS GIS. Departmental word processing is available for graduate students. ARC-INFO geographic information system operates in a multi-user within the department.

Geology (Geol.)

201. **Physical Geology for Teachers.** I, II. 3 hr. (Credit cannot be obtained for both Geol.201 and Geol. 1 or 5.) PR: High school teaching certificate and consent. Composition and structure of earth and the geologic processes which shape its surface.
221. **Geomorphology.** II. 3 hr. PR: Geol. 1 or 5. (Optional field trip at student's expense.) An examination of the physical processes which shape the surface of the earth, with emphasis on fluvial processes and environmental geomorphology. (Also listed as Geog. 221.) (Offered in Spring of odd years.)
222. **Glacial Geology.** I. 3 hr. PR: Geol. 1 or 5. (Optional field trip(s) at student's expense.) Introduction to glaciology and glacial geology, with emphasis on topographic form and the nature of glacial deposits. The Quaternary history of North America is stressed.
228. **Photogeology.** II. 3 hr. PR: Geol. 127, 152, or consent. Instruction in basic and advanced techniques of air-photo interpretation.
231. **Invertebrate Paleontology.** I. 4 hr. PR: Geol. 3, 4, 184, Stat. 101, or consent. (Weekend field trip required at student's expense.) Invertebrate fossils: biologic classification, evolutionary development, ecology, and use in correlation of strata.
235. **Introductory Paleobotany.** I. 4 hr. PR: Geol. 3. (Required Saturday field trips at student's expense.) Resume of development of principal plant groups through the ages, present distribution, mode of occurrence and index species, methods of collection.

235. *Introductory Paleobotany*. I. 4 hr. PR: Geol. 3. (Required Saturday field trips at student's expense.) Resume of development of principal plant groups through the ages, present distribution, mode of occurrence and index species, methods of collection.

251. *Advanced Topics in Structural Geology*. II. 4 hr. PR: Geol. 152 and 261 or consent; Math. 15; undergraduates need consent. (Two two-day field trips required. Basic field equipment and field trip at student's expense.) Studies into the development of structures emphasizing both theoretical and experimental approaches. (Offered in Spring of odd years.)

261. *Stratigraphy and Sedimentation*. II. 3 hr. PR: Geol. 3, 4, 152, 185, or consent. (Two-day field trip required. Basic field equipment and field trips at student's expense.) Study of sediments and sedimentary rocks. Field techniques stressed as data gathered and interpreted from rocks of Pennsylvanian age in the Morgantown vicinity.

266. *Appalachian Geology Field Camp*. S. 6 hr. PR: Geol. 152, 185, 261, and consent. (Living expense in addition to tuition must be paid at time of registration.) Practical experience in detailed geological field procedures and mapping.

270. *Mineral Resources*. II. 3 hr. PR: Geol. 1, 184. Description, mode of occurrence, and principles governing the formation of ore deposits.

272. *Petroleum Geology*. II. 3 hr. PR: Geol. 152. Origin, geologic distribution, methods of exploration and exploitation, uses and future reserves of petroleum and natural gas in the world.

273. *Petroleum Geology Laboratory*. II. 1 hr. PR or Conc.: Geol. 152. Well sample description, correlation, and interpretation. Construction and interpretation of subsurface maps used in exploration for hydrocarbons.

274. *Coal Geology*. I. 3 hr. PR: Geol. 152 or consent. Introduction to the origin, composition, geologic distribution, and exploration of coals.

287. *Igneous and Metamorphic Petrology*. 4 hr. PR: Geol. 185, and 385 or consent. Review of current theories for generation and evolution of magmas, and techniques of determining metamorphic conditions from mineral assemblage. Study of igneous and metamorphic rocks in thin section. (Weekend field trip at student's expense.) 3 hr. lec., 1 hr. lab.

290. *Geologic Problems*. I, II, S. 1-6 hr. (12 hr. max.). PR: Consent. (Also includes field trips such as Florida Bay carbonate trip.) Special problems for senior and graduate students.

294. *Introduction to Geochemistry*. II. 4 hr. PR: Chem. 16. Basic review of physical and aqueous chemistry, discussion of the basic geochemical processes; calcium carbonate chemistry, diagenetic processes, weathering, the silicate and iron systems.

315. *Environmental Geoscience*. I. 3 hr. PR: Geol. 221 or concurrent registration or consent for nongeology majors. (Field trips and independent field project required.) Principles, practice, and case histories in application of earth science to environmental problems. Includes: water quality; landslides; subsidence; waste disposal; legal aspects; and geologic aspects of land-use planning.

329. *Problems in Geomorphology*. I, II. 1-4 hr. (Also listed as Geog. 329.)

332. *Paleoecology*. II. 3 hr. PR: Geol. 231 and 261 or consent. Methods of paleoecologic analysis in sedimentary geology. Topics include trace fossil analysis, shell biogeochemistry, community paleoecology, biofacies analysis of basins, and Precambrian paleoecology.

341. *Carbonate Sedimentology*. II. 4 hr. PR: Geol. 231, 261. Origin and distribution of modern marine carbonate sediments as models for interpretation of ancient limestone and dolomite facies complexes. Laboratory experience in thin section petrography of skeletal and nonskeletal carbonate grains, and rock compositions and fabrics.

346. *Advanced Sedimentation*. I. 4 hr. PR: Geol. 261 or consent. (Required field trips at student's expense.) Origin of sedimentary rocks; principles involved in interpretation of ancient geography, climates, animals, and plants. Emphasis on detrital sediments and rocks.

351. *Tectonics*. II. 3 hr. PR: Geol. 152 and 261 or consent; Math. 15; undergraduates need consent. Theories of large-scale deformational processes operating within the earth's crust and mantle emphasizing regional structural geology outside the Appalachians. (Offered in Spring of even years.)

352. *Exploration Geophysics 1*. I. 4 hr. PR: Math. 15, Geol. 152, 261, or equiv. Studies in applied geophysics with particular emphasis on techniques in reflection and refraction seismology, and gravity, and their application to energy resource exploration. (3 hr. lec., 1 hr. lab.)

353. *Exploration Geophysics 2*. II. 4 hr. PR: Math. 15, Geol. 152, 261 or equiv. Geologic interpretation of geophysical data with emphasis placed on structural and stratigraphic interpretation of seismic records in explorations for hydrocarbon deposits.

357. *Basin Structures*. I. 4 hr. PR: Geol. 152, 261, or equiv. The origin, development, and distribution of basins and the structure found within basins throughout the world are studied. The distribution of energy-related minerals related to basins and structural accumulations are emphasized.

363. *Groundwater Hydrology*. I. 3 hr. PR: Geol. 1 or consent. Study of the principles of groundwater hydrology; occurrence, development, uses, and conservation of groundwater.

364. *Advanced Groundwater Hydrology*. II. 3 hr. PR: Geol. 1, 2, 363 or consent. Review of groundwater exploration, flow, and quality in various geologic terrains. Groundwater pollution and other environmental effects are covered, along with well pumping tests and modeling of groundwater flow.

376. *Coal Petrology*. II. 3 hr. PR: Geol. 274 or consent. Microscopic examination and determination of optical properties of coals, environment of deposition, diagenesis, and metamorphism of coals; coal chemistry and petrography.

385. *Optical Mineralogy and Sedimentary Petrology*. I. 4 hr. PR: Geol. 185 and one year of physics. Principles and practice in use of the petrographic microscope in identification of minerals by the immersion method and thin section; emphasis on sedimentary petrology.

394. *Physical Geochemistry*. I. 3 hr. PR: Geol. 1, 184, 185; Chem. 16. Phase diagrams, metamorphic facies, origin of the elements, chemical properties of ions, crystal chemistry of minerals, element distributions and geochemical cycles. (Offered in Fall of even years.)

395. *Aqueous Geochemistry*. II. 3 hr. PR: Geol. 1, Chem. 16, or consent. Review of basic chemical principles as they apply to aqueous geologic environments. Properties of water and the types, sources, and controls of the common and environmentally significant chemical species dissolved in water.

399. *Quantitative Methods in Geo-Sciences*. II. 3 hr. PR: Stat. 212 or 311, Geog. 200 or consent. Brief review and introduction to multivariate quantitative techniques as applied to geology and geography. (Also listed as Geog. 399.)

420. Advanced Topics. I, II. 1-12 hr. Includes separate courses in karst, advanced hydrology, instrumentation, paleoecology, regional geology, paleobiogeography, advanced coal petrology, and advanced paleontology.

432. Micropaleontology. I. 4 hr. PR: Geol. 231. Identification of Foraminifera, Ostracoda, and conodonts; emphasis on classification, nomenclature, and use of paleontological literature. (Offered in Fall of even years.)

492. Non-Thesis Research. I, II, S. 1-12 hr. PR: Consent. Supervised non-thesis research for M.S. Options 2, 3, and 4. Report required by arranged deadline.

496. Graduate Seminar. I, II. 1-6 hr.

497. Research. I, II. 1-15 hr.

HISTORY

Ronald L. Lewis, Chairperson of the Department

202 Woodburn Hall

Degrees Offered: Master of Arts, Doctor of Philosophy

Graduate Faculty: Members Bagby, Blobaum, Good, Hammersmith, Howe, Hudson, Jakobson, Kemp, Lewis, Lustig, Maxon, Maxwell, McCluskey, McKivigan, and Super. Associate Members Arnett, O'Brien, and Parkinson.

The Department of History offers graduate courses in the history of the United States, Europe, Africa, Asia, Latin America, and science and technology. Courses are designed to prepare students in historiography, research methods, and interpretation. Students can select concentrations leading to preparation for careers in teaching and scholarship and as specialists for various branches of government, business, and service. Students in the program are normally expected to pursue the degrees of master of arts, the master of arts option in public history, or the doctor of philosophy.

Master of Arts (M.A.)

Admission. Students seeking admission to the M.A. program should have the equivalent of a bachelor's degree in history. Application requirements include transcripts (a minimum of a 3.0 average in history courses is expected), three letters of recommendation, and scores on the Graduate Record Examination General Aptitude Test.

Requirements. Completion of a minimum of 30 hours of course work with at least a B grade, and achievement of a reading proficiency in one foreign language. All 30 hours may be in history, or students may select up to six hours outside of the department. The history course work shall include a well-defined core area (selected from the fields listed for comprehensive examinations or approved by the graduate studies committee) of at least 12 hours. In addition, students are expected to enroll continuously in Hist. 499—Department Colloquium. Credit for this course does not count towards the degree. Students are also required to complete a master's thesis. A maximum of six hours of credit for Hist. 497, Research, can be taken for writing the thesis and for fulfilling the 30-hour M.A. requirement. Candidates for the M.A. are required to pass a final oral examination on their core area of study and thesis.

M.A. Option in Public History

The department offers an M.A. option in public history. This option is intended to provide enhanced employment opportunities to graduate students interested in using their education in history in a profession other than teaching. Extensive resources of the state are used for interpretation and

preservation. This is the only full public history graduate curriculum in West Virginia.

The public history option is open to selected students in the M.A. program. Students apply for admission as they would for the regular M.A. program, and should indicate on their application that they are interested in public history. In addition, students should submit a two-page letter of application, which should indicate the student's background in history or public history and why the student wants to be admitted to the option; this letter should be addressed to the Chairperson of the Department of History. Students may be admitted to the option who do not have a major in history by making up deficiencies in their course work for undergraduate credit; these courses may be taken while the students are enrolled for graduate classes or students may be able to test out of some courses.

The public history option consists of 15 hours of public history courses (introduction to public history, two of three methods courses in historical editing, archival management, historic site interpretation and preservation, and a six-hour supervised internship). Special topics courses are occasionally offered in historic preservation and may be taken in lieu of courses outside the Department of History. Students are required to take a 300-400 level readings/research seminar sequence in one subject area in the Department of History outside public history. Course descriptions, syllabi, policies and procedures, and a list of internship possibilities are available at the Department of History on request by contacting the coordinator of the public history option.

History of Science and Technology

The Department of History offers a special field in the history of science and technology as part of the regular M.A. and Ph.D. programs. This field is also suitable as an outside field for graduate students in engineering, the sciences, or education. Its purpose is to stimulate the development of a more comprehensive and integrated approach to liberal education and to encourage the wider use of the intellectual and technical resources of the University.

Students are expected to take introductory colloquia in the history of science and technology and to draw up individualized plans of study designed to give them a deeper understanding of those subject areas in which they have a particular interest. The department has close ties to the Institute for the History of Technology and Industrial Archeology, and students in this field have the opportunity to learn the direct application of knowledge by working on projects undertaken by the Institute.

Requirements for admission are the same as those for other students in the department. However, interested students with backgrounds in the sciences or engineering rather than history are encouraged to contact the director of graduate studies for further information.

Doctor of Philosophy (Ph.D.)

Admission. Students seeking admission to the Ph.D. program should have the equivalent of a M.A. in history. Application requirements include a transcript (a minimum of a 3.0 average in graduate history courses is required), three letters of recommendation, and scores on the Graduate Record Examination General Aptitude Test. Students should also include a statement of purpose and an example of their written work as a part of the application.

Requirements. Requirements for the Ph.D. degree in history include the general WVU requirements; a reading knowledge of two foreign languages; completion of two readings/seminar sequences beyond those offered for the M.A.; completion of one graduate-level historiography course; continuous enrollment in Hist. 499—Department Colloquium; passing the Ph.D. comprehensive examination of two parts (oral and written) administered by a committee of faculty members (normally at the end of a full-time student's second year of study); preparation of an acceptable dissertation based on original investigation, and successful defense of the dissertation in a final examination.

A candidate must offer a program of study in four fields, at least three of which must be in history; the other may be in a related field approved by the department. The department does not accept courses toward a degree with a grade lower than a B. Fields available in the department include ancient-medieval, Europe: 1350-1815, Europe since 1789, United States to 1865, United States since 1865, Africa, Asia, Latin America, history of science, and Britain.

Dissertation work normally should be in modern America, Appalachian/regional history, science and technology, modern Europe or modern Africa.

Students working in these areas, either at the M.A. or Ph.D. level, have the opportunity to study with adjunct professors and faculty from other departments and universities.

History (Hist.)

200. *Greece and Rome.* 3 hr. Covers the Minoan and Mycenaean civilizations, Archaic and Classical Greece, Alexander the Great and the Hellenistic Age, the Roman Republic, and Etruscan and Carthaginian states, and the rise of the Roman Empire.
201. *Social and Economic History of the Middle Ages, 300-1000.* 3 hr. (Hist. 103 is recommended as preparation.) Topics include the social-economic crisis of the late Roman and German institutions, the Merovingian and Carolingian economics, Pierenne Thesis, and transition to feudal society.
204. *Ancient and Medieval Science. I.* 3 hr. Examination of scientific achievements from ancient myths to medieval philosophies of nature. Stresses the internal coherence of the approaches to nature taken by various cultures. No scientific background is assumed.
205. *The Renaissance.* 3 hr. The underlying political, economic, and social structure of fourteenth and fifteenth century Italy with concentration on the significant intellectual and cultural trends which characterized the age. Some consideration given to the problem of the impact of the early Reformation movement upon Renaissance culture.
206. *The Reformation.* 3 hr. Distinguishing theological characteristics of the major Reformation movements with concentration on the effect of religious-intellectual crisis on the political and social structure of the sixteenth century.
207. *Early European Science and Culture.* 3 hr. Examination of European intellectual history from the Renaissance to the early eighteenth century with particular attention being paid to contribution of Copernicus, Bacon, Descartes, Kepler, Galileo, and Newton.
208. *Science and Society, 1750-1914.* 3 hr. Historical examination of the relationship between science and technology with particular attention being paid to the doctrines of Positivism, Darwinism, and Scientific Socialism.

209. *Brazil: Colony to World Power*. 3 hr. Examines the transition of Brazil from a colony to a world power, with special emphasis on recent economic developments, regional diversity, political patterns, foreign affairs, and race relations.

210. *Modern Spain*. 3 hr. Survey of the Moslem, Hapsburg, and Bourbon periods followed by an examination of modern political and social forces, the Civil War, and the rule of Franco.

211. *Technology in the Industrial Revolution*. I. 3 hr. Technological and social change in Great Britain and United States. Case studies illustrating the nature of technological development and providing an understanding of the ways in which technology has shaped human experience.

212. *Introduction to Public History*. 3 hr. Introduction to a wide range of career possibilities for historians in areas such as archives, historical societies, editing projects, museums, business, libraries, and historic preservation. Lectures, guest speakers, field trips, individual projects.

213. *Bourbon France*. 3 hr. French history from the reign of Henry IV to the reign of Louis XVI. Special attention given to the reigns of Louis XIII and Louis XIV. Political, cultural, and intellectual history emphasized.

214. *The Revolutionary-Napoleonic Era*. 3 hr. French history from mid-eighteenth century to 1815. Special attention given to the background of the French Revolution of 1789, to the political and social history of the revolution, and to Napoleon's nonmilitary achievements.

215. *European Diplomatic History, 1815 to 1919*. 3 hr. Develops an understanding of the forces, men, and events which determined diplomatic relations between the major powers.

216. *European Diplomatic History, 1919 to Present*. 3 hr. Scope similar to Hist. 215.

219. *Revolutionary Russia, 1905-1939*. 3 hr. Detailed study of the revolutionary era of Russian/Soviet history with emphasis on the origins of Russian radicalism, the upheavals of 1905 and 1917, and Stalin's "revolution from above."

220. *The U.S.S.R., 1939 to Present*. 3 hr. Detailed study of the recent social and political history of the Soviet Union. The Soviet experience in World War II, Stalin's last years, and the conflict between reformism and conservatism since Stalin's death.

222. *Twentieth-Century Germany from Weimar to Bonn*. 3 hr. The Weimar Republic, the Third Reich, and the two German states created after World War II.

225. *History of Modern China*. 3 hr. Introduction to modern China (since 1839) with attention to China's Confucian heritage; examines in detail the Chinese effort to modernize in the face of Western diplomatic and economic pressure; specific attention to China's Nationalist and Communist revolutionary traditions.

226. *History of Modern Japan*. 3 hr. Modern Japan (since 1868) with attention to the development of Japanese institutions and ideas in earlier periods, especially the Tokugawa Era (1600-1868); examines the rapid pace of economic change in the nineteenth and twentieth centuries along with the important social, political, and diplomatic implications of this change.

227. *East Africa to 1895*. 3 hr. East Africa from earliest times to beginning of European control. Population movement and interaction, development of varying types of polity, revolutionary changes, and the European scramble for East Africa form the major focus.

228. *East Africa Since 1895*. 3 hr. History of colonial rule and movement to independence in East Africa. Political, economic, and social changes will be examined with particular emphasis on the rise and triumph of African nationalism.

229. *History of Africa: Pre-Colonial*. 3 hr. History of Africa from earliest times to the middle of the nineteenth century. Particular emphasis on population movement and interaction, state formation, and the development of trade in sub-Saharan Africa as well as the impact of such external influences as Christianity and Islam.

230. *History of Africa: European Dominance to Independence*. 3 hr. History of Africa from the middle of the nineteenth century to the 1960s. Political and economic trends will form major focus.

231. *Seventeenth Century Britain, 1603-1715*. 3 hr. The more significant political, social, economic, religious, and intellectual developments of Britain during a century of revolution and of the men and women who interacted with those movements.

232. *Eighteenth Century Britain, 1715-1832*. 3 hr. The Age of Aristocracy, the political, social, religious, economic, and intellectual forces which produced it, and the reasons for its decline under the combined impact of the Industrial, Agricultural, American, and French revolutions.

245. *History of American Women*. 3 hr. Examination of the history of American women from 1607 to the present, with emphasis on working conditions, women's rights, development of feminism, women's role in wartime, and women in the family.

246. *History of European Women*. 3 hr. A survey of the history of European women from antiquity to the present, with emphasis on the philosophic, economic, and societal sources of women's oppression and on women's role in work, the family, and feminist movements.

251. *History of Black People in America to 1900*. 3 hr. Slave trade and evolution of slavery in the New World, the attack upon slavery and its destruction, the South and the blacks during Reconstruction, and the age of Reaction and Racism, 1875-1900.

252. *Afro-American History Since 1865*. 3 hr. Reconstruction, the age reaction and racism, black migration, black nationalism, blacks in the world wars, and desegregation.

253. *Civil War and Reconstruction*. 3 hr. Causes as well as the constitutional and diplomatic aspects of the Civil War; the role of the American black in slavery, in war, and in freedom; and the economic and political aspects of Congressional Reconstruction.

257. *The United States From McKinley to the New Deal, 1896 to 1933*. 3 hr. American national history from William McKinley to Franklin D. Roosevelt. Particular attention is given to the great changes in American life after 1896; national, political, economic, social, and cultural development; the Progressive Era in American politics; and alterations in American foreign relations resulting from the Spanish-American War and World War I.

259. *Recent American History, 1933 to Present*. 3 hr. Detailed study of American national history from the inauguration of Franklin D. Roosevelt to the present. Emphasis on the New Deal; on Roosevelt's foreign policies and their impact on American social, technological, and cultural developments; and United States domestic problems and foreign relations since 1945.

263. *American Diplomacy to 1918*. 3 hr. (Assumes some knowledge of the period such as that obtained in Hist. 52 and 53.) American foreign policy and diplomacy from the adoption of the Constitution to the end of World War I.

264. *American Foreign Policy and Diplomacy, 1918 to the Present*. 3 hr. (Assumes some knowledge of the period such as that obtained in Hist. 2, 53, or 161.) America's foreign policy and growing involvement in international relations including the U.S. role in World War II, the Korean War, and Vietnam.

266. *American Economic History to 1865*. 3 hr. Origins and development of American business, agricultural, and labor institutions; problems, and policies, from 1600 to 1865; influence of economic factors upon American history during this period.

267. *American Economic History Since 1865*. 3 hr. Scope similar to that stated for Hist. 266.

268. *The Old South*. 3 hr. (For advanced undergraduate and graduate students.) History of the South—exploring peculiar differences that led to an attempt to establish a separate nation. The geographical limitation permits a detailed study of economic and social forces within the context of the larger national history.

269. *The New South*. 3 hr. Integration of the South into the nation after the Civil War. Emphasis on southern attitudes toward industrialization, commercial agriculture, organized labor, and the black. Special attention to the southern literary renaissance and conservative and progressive politics of the southern people.

273. *Appalachian Regional History*. 3 hr. Historical survey of Central Appalachia's three phases of development: traditional society of the nineteenth century, the transformation of a mountain society by industrialization at the turn of the twentieth century, and contemporary Appalachia.

274. *The City in American History*. 3 hr. A survey of urban history in the United States, including the Colonial period, with emphasis on the nineteenth and twentieth centuries, focusing on physical development of cities (planning, transportation, architecture, suburbanization) and social history.

290. *Introduction to Historical Research*. 3 hr. (Required for History majors; non-majors by consent.) Introduction to research techniques useful for history. Instruction in locating sources, taking notes, and writing research papers.

301. *Readings in Medieval History*. 3-6 hr. Crusades and intellectual history are the focus. Readings in preparation for the medieval field may be selected by graduates. Hist. 103 is urged strongly for undergraduates; also a reading knowledge of Latin, French or German is recommended for all students.

305. *Readings in English History*. 3-6 hr. Directed readings of scholarly books and articles, primarily in the history of England from about 1450 to about 1625 but with some opportunity for the student to fill gaps in the student's knowledge of other periods of English history.

309. *Readings in Central European History*. 3-6 hr. All students will read and discuss selected works illustrating outstanding scholarship or interpretative problems related to fifteenth, sixteenth, and early seventeenth century history. In addition, opportunity will be provided for each student to pursue an independent reading project tailored to the student's special interests.

310. *Historic Site Interpretation and Preservation*. 3 hr. PR: Hist. 212. Introduction to historic site interpretation and preservation, including establishing criteria, site inventory, and recording techniques using the "case study" method. Lectures, films, discussions, and field projects will introduce students to the rapidly growing area, including environmental impact work.

311. *Archival Management*. 3 hr. PR: Hist. 212. Principles and practices of archival work within a laboratory context. Includes lectures and selected readings illustrated by holdings and policies of West Virginia and Regional History Collection of the WVU Library.

312. *Practicum in Historical Editing*. 3 hr. PR: Hist. 212. Principles and practices of historical editing in a laboratory context. Includes lectures and readings with illustrations from ongoing editing projects. Student prepares materials from the West Virginia Collection of the WVU Library for publication.

313. *Readings in Eastern European History.* 3-6 hr. Intensive readings on specific topics in Russian, Soviet or East European history. Students should normally have had History 117 and 118, or their equivalents. Primarily designed for graduate students and selected undergraduates.

317. *Readings in Western European History.* 3-6 hr. This course, primarily for graduate students and selected undergraduates, is designed for an intensive reading program on special problems in western European history.

321. *Readings in Asian History.* 3-6 hr. Intensive readings in the history of East Asia (especially China and Japan) since the nineteenth century; students should normally have had Hist. 225 and 226, or their equivalents; reviews, as well as bibliographical and historiographical essays, required.

325. *Readings in African History.* 3-6 hr. This course will normally focus on readings and discussion on problems in the history of pre-colonial Africa, the major works in African history, and recent interpretations in the field.

330. *Readings in Latin American History.* 3 hr. PR: Graduate status. Critical examination of selected sources and topics for understanding and interpreting Latin American history.

355. *Readings in American History, 1763-1865.* 3-6 hr. A course of supervised reading and reports designed to prepare students for intensive study in a seminar or for field examinations in the early national period. Students are expected to acquire comprehensive and detailed bibliographical knowledge.

359. *Readings in American History, 1850-1898.* 3-6 hr. A survey of the narrative and interpretative literature of the Civil War, Reconstruction, and the Gilded Age. Students will be expected to make weekly or biweekly reports on assigned readings and also to prepare a critical essay on some aspect of American historiography for this period.

363. *Readings in American History, 1898 to Present.* 3-6 hr. Readings and class-led discussion of one paperback book per week, and preparation of a paper based on these books and the class discussion of them. Usually concentrates on post-World War II foreign relations.

373. *Readings in Local and Regional History.* 3-6 hr. A course for graduate students and seniors in the history of West Virginia and neighboring states, which form what is known as the Trans-Allegheny or Upper Ohio region.

375. *Readings in Science and Technology.* 3-6 hr. Directed reading of scholarly books and articles dealing with selected topics in the history of science and technology.

381. *Intellectual and Social History of the United States to 1876.* 3 hr. The objective of the course is to establish for graduate students usable frames of reference for intellectual and social history. The basic premises of various historians are examined as they have been applied to the history of the United States before 1876.

382. *Intellectual and Social History of the United States Since 1876.* 3 hr. A continuation of Hist. 381, with the same objective of establishing usable frames of reference for intellectual and social history, with the focus on the history of the United States since 1876. Special attention is devoted to the problems of very recent or contemporary history.

391. *Readings in American Labor History.* 3 hr. PR: Consent. Readings seminar designed to provide a broad knowledge of American labor and working class history by focusing on conceptual issues and methods of research that have shaped the development of this field.

392. *History of American Agriculture*. 3 hr. A readings course to acquaint students with the origins and evolution of American agriculture, with particular emphasis upon scientific, technological, and economic development; to familiarize them with some public and private agricultural organizations; and to give them an historical understanding of contemporary agricultural problems and policies.

402. *Seminar in Medieval History*. 3 hr. PR: Hist. 301 and reading knowledge of Latin plus French or German or Italian. Crusades and intellectual history of Europe in the Middle Ages with emphasis on the period from 1000 to 1300.

410. *Seminar in Central European History*. 3 hr. An intensive survey of the bibliographical aids and printed source materials available in the field of Reformation history. A research paper and a bibliographical essay will be presented by each student. Reading knowledge of German and French strongly recommended.

411. *Internship in Public History*. 3 hr. PR: Hist. 212 and two of following: Hist. 310, 311, 312. A professional internship at an agency involved in a relevant area of public history. Supervision will be exercised by both the Department of History and the host agency. Research report or finished professional project required.

414. *Seminar in Eastern European History*. 3-6 hr. PR: Hist. 117, 118 or equiv. Research seminar on selected topics in Russian, Soviet or East European history. One major paper and extensive reading based on available source materials is required.

418. *Seminar in Western European History*. 3 hr. A research seminar in selected topics in western European history. Requirements: examinations, problem papers, research papers, and extensive reading. A reading knowledge of the appropriate languages is required.

422. *Seminar in Asian History*. 3 hr. Advanced readings and research in East Asian history; specific emphasis on research tools and techniques; research paper based on English-language sources required; students should normally have had Hist. 225 and 226 or their equivalents.

426. *Seminar in African History*. 3 hr. The seminar will normally focus on Eastern Africa in the colonial period. Location and use of source materials will be emphasized as well as economic and political developments. Students will spend considerable time in research and writing on selected aspects of Eastern African history.

441. *Seminar in Latin American History*. 3 hr. PR: Consent. Survey of Latin American historiography, location and use of primary source materials, discussion of research techniques, and the writing of a research paper. Reading knowledge of Spanish, Portuguese, or French will be helpful.

456. *Seminar in American History, 1763-1865*. 3 hr. Students work together and with the instructor on historical materials of the era, confronting the problems and learning the techniques for using different kinds of original materials. Periodic progress reports are required at each meeting and one major paper, derived primarily from the original materials being used.

460. *Seminar in American History, 1850-1898*. 3 hr. Directed research in recent American history including guidance in method of research and manuscript preparation.

464. *Seminar in American History, 1898 to Present*. 3 hr. Directed research in recent American history including guidance in method of research and manuscript preparation.

474. *Seminar in Local and Regional History*. 3 hr. A seminar for graduate students in the history of West Virginia and neighboring states, which form what is known as the Trans-Allegheny or Upper Ohio region.

475. Seminar in Science and Technology. 3 hr. PR: Hist. 375. Directed research in selected topics in the history of science and technology.

477. American Historiography. 3 hr. A review of the major American historians and biographers and their interpretative studies. The nationalism, imperial, frontier, sectional, social and intellectual schools of history are studied as well as those historians who have concerned themselves with the problems of writing history.

478. European Historiography. 3 hr. Readings of selected works representative of each of the following historical periods: Ancient, Medieval, Renaissance-Reformation, Early Modern, and Modern. Reports required with attention to style, purpose, philosophy, and methodology of the historians selected. Attention to trends, major breakthroughs, and classics in the writing of European history. Reading knowledge of Greek, Latin, French, German, or Italian an asset.

481, 482. Special Problems. 1-3 hr. ea.

490. Teaching Practicum. 1-3 hr. PR: Consent. Supervised practices in college teaching of history. (Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibilities.)

493. Folger Institute Seminar. 3 hr. PR: Graduate standing. (Enrollment is by special application only. Contact department chairperson for information.) Seminar conducted by distinguished scholars and held at the Folger Institute of Renaissance and Eighteenth Century Studies in Washington, D.C. Topics vary. (Also listed as Engl. 493.)

497. Research. 1-15 hr.

HORTICULTURE

Suman Singha, In Charge of Graduate Program in Horticulture

2086 Agricultural Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Baugher, Ingle, Popenoe, and Singha. Associate Members Bearce and Young.

The College of Agriculture and Forestry offers a master of science degree in horticulture based upon the biological and physiological sciences. Students entering the program must have an adequate background in agriculture, biology, and chemistry. Deficiencies in these areas must be corrected early in a student's program by enrollment in specified courses. Admission requirements are those of the College of Agriculture and Forestry.

The following courses must be completed with a passing grade before admittance to regular graduate student status: Hort. 107, one semester of organic chemistry, Biol. 169, and Agron. 2.

The following courses must be completed with a passing grade before the master of science in horticulture can be conferred: Hort. 204, Ento. 204, and Pl. Path. 201. The credit hours from these may be counted toward the master of science degree in horticulture if they are taken as part of the last ten hours of undergraduate course work with prior permission or if they are taken during graduate work.

Faculty and facilities are available for thesis research in plant propagation, greenhouse management, ornamental production, tree and small fruit production, and fruit physiology and storage. A thesis is required. Graduates are employed by private industry, governmental agencies, and educational institutions, or become self employed. Horticulture students interested in

studying for the Ph.D. degree should apply for admission into the Plant and Soil Science option of the Ph.D. degree program in Agricultural Sciences.

Horticulture (Hort.)

- 204. *Plant Propagation.* II. 3 hr. PR: Pl. Sc. 52 or consent. Study of practices of plant propagation and factors involved in reproduction in plants.
- 242. *Small-Fruits.* I. 3 hr. PR: Pl. Sc. 52, Hort. 107, or consent. (One 2-day field trip required.) Taxonomic, physiological, and ecological principles involved in production and handling of small-fruits. 2 lec., 1 lab. (Offered in Fall of odd years.)
- 243. *Vegetable Crops.* I. 3 hr. PR: Pl. Sc. 52 or consent. (One 3-day field trip required.) Botanical and ecological characteristics influencing the production of vegetable crops. 2 hr. lec., 1 hr. lab. (Offered in Fall of even years.)
- 244. *Handling and Storage of Horticultural Crops.* I. 3 hr. PR: Pl. Sc. 52; Chem. 16. Characteristics of perishable crops. Methods and materials used to maintain quality. 2 lec., 1 lab. (Offered in Fall of odd years.)
- 245. *Greenhouse Management.* II. 3 hr. PR: Two semesters of Inorganic Chemistry and Hort. 107 or consent. Greenhouse as a controlled plant environment. How to regulate factors influencing plant growth and development within specialized environments of greenhouses.
- 246. *Tree Fruits.* I. 3 hr. PR: Pl. Sc. 52 or consent. Principles and practices involved in production of tree fruits. 2 lec., 1 lab. (Offered in Fall of even years.)
- 301. *Post-Harvest Physiology.* II. 3 hr. Physiology and biochemistry of harvested crops. 1 lec., 2 labs. (Offered in Spring of odd years.)

Plant Science (Pl. Sc.)

- 420. *Special Topics.* I, II, S. 1-6 hr. Special study in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.
- 450. *Seminar.* I, II. 1 hr. Graduate seminar in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.
- 497. *Research.* I, II, S. 1-15 hr. Graduate research in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

INDUSTRIAL ENGINEERING

Ralph W. Plummer, Chairperson

727 Engineering Sciences Building

Degree Offered: Master of Science in Industrial Engineering

Industrial Engineering Areas of Emphasis available for:

Master of Science in Engineering

Master of Science

Doctor of Philosophy

Graduate Faculty: Members Ahluwalia, Byrd, Creese, Gopalakrishnan, Iskander, Jaraiedi, Moore, Myers, Plummer, Stobbe, and Tompkins. Associate Member Fowler.

Graduate programs in industrial engineering are designed to give students experience in developing innovative solutions to real problems. Innovation in this case implies the implementation of creative ideas, in contrast to pure research, which is conducted without an intended potential use. In this context, graduate students in the department are actively involved with the people and organizations that need creative solutions to real problems. Graduate students can expect to develop their creative abilities to

be effective in innovative environments while developing their abilities to communicate and working with individuals to implement new ideas.

Master of Science in Industrial Engineering (M.S.I.E.)

Master of Science in Engineering (M.S.E.)

Master of Science (M.S.)

Three degrees are offered at the master's level: M.S.I.E., M.S.E., and an M.S. with an emphasis in occupational health and safety engineering. The M.S.I.E. degree program is appropriate for students with a B.S. in Industrial Engineering, whereas the M.S.E. degree program is designed for students having a baccalaureate degree in a technical field other than industrial engineering who wish to pursue a broader, more interdisciplinary program of graduate studies. In both the M.S.I.E. and the M.S.E. degree programs, students will select courses in decision sciences and production systems, manufacturing systems, or the ergonomics areas. A description and listing of requirements for the M.S. in occupational health and safety engineering, which is administered by the Department of Industrial Engineering, are presented elsewhere in Part 2 of this catalog.

An undergraduate degree in either another engineering field or the basic sciences is required for admission to both the M.S.E. and M.S. programs. Students trained in the areas of mathematics, statistics, physics, and computer science are generally well prepared for graduate study with an emphasis in decision sciences/operations research techniques, or production systems, while many chemistry and biology majors will find excellent career opportunities in the field of occupational health and safety. The M.S. program is designed specifically for this latter group of students.

Students must comply with the rules and regulations as outlined in Part 5 of this catalog for graduate work in the College of Engineering. Each master's candidate must follow a planned program of study which contains a minimum of 30 semester credit hours, including a thesis of not more than six hours of research or 36 credit hours, including a problem report of not more than three hours of credit.

Required courses for the M.S.I.E. and the M.S.E. are determined by the emphasis area of the student (i.e., decision sciences, manufacturing systems, or applied ergonomics) and can be obtained by writing to the department. M.S. in occupational health and safety engineering course requirements are listed elsewhere in Part 2 of this catalog. Specific requirements may be obtained by writing to the department.

As a general rule, each student must satisfy the listed prerequisites for each course included in his/her graduate plan of study. Prerequisite deficiencies are usually made up by taking the necessary prerequisite courses, which will be included in the plan of study, but normally are not counted for credit toward the master's degree. However, certain prerequisite courses can be taken by examination.

While required credit in research (I.E. 497) is devoted to a problem report or thesis preparation, neither is automatically approved after the required number of semester hours of research work have been completed. The thesis or problem report must conform with the general requirements of the University and with the written requirements of the Department of Industrial Engineering.

Final Examination. A candidate will be required to pass an oral examination on course work and the thesis or problem report.

Doctor of Philosophy (Ph.D.)

A candidate for the degree of Doctor of Philosophy (Ph.D.) must comply with the rules and regulations of the College of Engineering and the University. A program with a major in industrial engineering, designed to meet the needs and objectives of each student, will be developed in consultation with the student's adviser and the student's Advisory and Examining Committee. Early in the doctoral program the student must pass an examination to demonstrate master's-level proficiency in industrial engineering subject matter. Upon completion of the course work, the student must pass an examination to be admitted to candidacy. An acceptable dissertation must be written.

Industrial Engineering (I.E.)

201. *Principles of Solidification.* 3 hr. PR: I.E. 200 or consent. Material and energy balances, solidification of metals, riser and gating systems for castings, fluidity of metal, casting design, and molding processes.
202. *Manufacturing Processes.* 2 hr. PR: Ch.E. 105, M.A.E. 43. Lectures and demonstrations relating to materials, properties, parameters, design, equipment, economics and computer control of processing systems emphasizing casting, machining, joining and forming operations.
203. *Manufacturing Processes Laboratory.* 1 hr. Coreq.: I.E. 202. Laboratory experiments and demonstrations of the basic manufacturing operations of casting, machining and joining. Process parameter measurement, inspection techniques and CNC programming are performed and laboratory report writing is emphasized.
205. *Design for Manufacturability.* 2 hr. PR: I.E. 202 and I.E. 203. Aspects of design, manufacturing and materials; emphasis on design for manufacturability and assembly, including material selection and manufacturing processes on product cost. 2 hr. lec.
206. *Design for Manufacturability Laboratory.* 1 hr. PR: I.E. 202 and I.E. 203. Laboratory tasks dealing with manufacturing and materials; process selection, and cost estimation for component and subassembly design; emphasis on utilizing design for manufacturability and assembly software. 1 hr. lab.
214. *Analysis of Engineering Data.* 3 hr. PR: I.E. 113. Introduction to linear statistical models. Design and analysis of simpler experimental configurations occurring frequently in engineering studies. Similarities and differences between regression and experimental design models emphasized in a vector-matrix setting.
215. *Statistical Decision Making.* 3 hr. PR or Conc.: I.E. 113. Basic concepts of probability theory. Discrete and continuous distributions, joint and derived distributions, with application to industrial and research problems. Introduction to generating functions and Markov chains.
216. *Industrial Quality Control.* 3 hr. PR: I.E. 113. Principles and methods for controlling the quality of manufactured products, with emphasis on both economic and statistical aspects of product acceptance and process control.
222. *Job Evaluation and Wage Incentives.* 3 hr. Principles used in evaluating jobs, rates of pay, characteristics and objectives of wage incentive plans; incentive formulae and curves.
240. *Labor and Productivity.* 3 hr. PR: Consent. The work force as a critical element of productivity. Topics include industrial engineering involvement in collective bargaining, labor relations, and work practices.

242. *Production Planning and Control.* 3 hr. PR: I.E. 140; Conc.: I.E. 214. Principles and problems in forecasting, aggregate planning, material management, scheduling, routing, and line balancing.

243. *Facility Planning and Design.* 3 hr. PR: I.E. 242, 250. Problems of facility and equipment location. Long-range planning of industrial facilities. Block and detailed layout of manufacturing plants and general offices. Space utilization and allied topics in facility design.

249. *Design of Dynamic Materials Systems.* 3 hr. PR: I.E. 140 or consent. Application of industrial engineering theory and practice to selection of material systems and equipment including efficient handling of materials from first movement of raw materials to final movement of finished product. Present quantitative design techniques.

250. *Introduction to Operations Research.* 3 hr. PR: I.E. 113, 281. Basic tools and philosophies of operations research. Tools include: linear programming, Markov chains, queueing theory, and simulation. Other operations research techniques are presented as they relate to the overall systems philosophy.

251. *Analytical Techniques of Operations Research.* 3 hr. PR: I.E. 113 or consent. Nonlinear optimization techniques useful in operations research and industrial engineering studies. Classical optimization techniques, quadratic, geometric, and dynamic programming, branch and bound and gradient techniques.

260. *Human Factors Engineering.* 3 hr. PR: I.E. 113 and I.E. 140 or equiv. Includes the study of ambient environment, human capabilities, and equipment design. Systems design for the man-machine environment interfaces will be studied with emphasis on health, safety, and productivity.

261. *System Safety Engineering.* 3 hr. PR: Consent. The concepts of hazard recognition, evaluation analysis, and the application of engineering design principles to the control of industrial hazards.

277. *Engineering Economy.* 3 hr. Basic concepts of financial analysis investment planning and cost controls as they apply to management technology investment in manufacturing; financial planning and budgeting as applied to an engineering function.

280. *Industrial Engineering Problems.* 1-3 hr. PR: Consent. Special problems.

281. *Computer Applications in Industrial Engineering.* 3 hr. PR: Engr. 2, I.E. 140. Introduction to computer applications in manufacturing. Emphasis on system design and analysis and the role of computers in productivity improvement.

284. *Simulation by Digital Methods.* 3 hr. PR: I.E. 113, 281, or consent. Introduction to Monte Carlo simulation methods and their application to decision problems. Student identifies constraints on problems, collects data for modeling, and develops computer programs to simulate and analyze practical situations. Interpretation of results emphasized.

291. *Design of Production Systems 1.* 3 hr. PR: Senior standing in industrial engineering. The integration of industrial engineering principles in the design of productive systems. Emphasis will be on the analysis of different systems for productivity improvement.

292. *Design of Productive Systems 2.* 3 hr. PR: Senior standing in industrial engineering. Continuation of I.E. 291.

300. *Special Topics in Manufacturing Processes and Automation.* 3 hr. PR: I.E. 200 or equiv. Special topics concerning manufacturing processes and automation with special emphasis on manufacturing management.

302. *Advanced Manufacturing Processes.* 3 hr. PR: I.E. 200. Metal cutting economic models, solidification processes, bulk deformation, sheet metal and drawing, joining design and economics. Overall view of manufacturing systems. Introduction to numerical control programming and projects on numerical control equipment.

304. *Materials and Processing Systems Design.* 3 hr. PR: I.E. 200. The engineering design process, material design properties and selection systems, decision making and problem analysis techniques for materials and processing. Economic and cost systems, expert systems, failure analysis and quality systems for materials and process selection.

305. *Computer Integrated Manufacturing.* 3 hr. PR: Graduate standing. Several aspects of computerized manufacturing systems will be covered. Emphasis will be placed on computer fundamentals, computer aided design and manufacturing, numerically controlled (NC) machine tools, part programming, system devices, and direct digital control. 2 hr. lec., 1 hr. lab.

307. *Robotics and Flexible Automation.* 3 hr. PR: Graduate standing. This course will provide an understanding of the principles, capabilities and limitations of industrial robots and other flexible automation tools. Emphasis will be placed on kinematic analysis, trajectory planning, machine vision, and manufacturing automation. 2 hr. lec., 1 hr. lab.

308. *Advanced Problems in Manufacturing Engineering.* 1-3 hr. PR: I.E. 300 or 302; graduate standing. Special problems relating to one of the areas of manufacturing engineering, such as manufacturing processes, robotics, CAD/CAM, group technology, and manufacturing systems engineering.

309. *Computational Methods for Manufacturing Engineers.* II. 3 hr. PR: Graduate standing. Computational techniques applicable to manufacturing systems engineering problems; emphasis on use of personal computers. 2 hr. lec., 1 hr. lab.

314. *Design of Industrial Experiments.* 3 hr. PR: I.E. 214 or consent. Continuation of I.E. 214. More complex experimental design especially useful to engineering and industrial researchers, including factorials and optimum-seeking design. Emphasis on use of existing digital computer routines and interpretation of results.

325. *Engineering Management.* 3 hr. Unique problems of engineering organizations including project planning, managing creativity, coordinating design and development, and other topics relevant to engineering organizations.

338. *Technology Forecasting.* 3 hr. Various procedures used in forecasting technical developments.

340. *Work Analysis.* 3 hr. PR: Consent. Analysis of industrial engineering's involvement in analyzing work situations. Particular emphasis will be given to the use of industrial engineering as a change agent in improving work practices.

342. *Advanced Production Control.* 3 hr. PR: I.E. 250. Different mathematical models useful in the design of effective production control systems. The various models include: static production control models under risk and uncertainty; dynamic models under certainty, under uncertainty, and under risk.

353. *Applied Linear Programming.* 3 hr. PR: I.E. 250 or consent. Application of the assignment, transportation, and simplex algorithms to typical industrial problems. The methods and computational efficiencies of the revised simplex and other algorithms are also studied.

355. *Scheduling and Sequencing Methods.* 3 hr. PR: I.E. 250. Theory and applications of analytical models used in the scheduling of operations. Topics include: single machine scheduling models; flow shop models; job shop models; and assembly line balancing methods.

358. *Special Topics in Systems Analysis and Operations Research.* 3-6 hr. PR: Consent. Special topics from recent developments in operations research and related fields. Special emphasis will be placed on interests of current graduate students.

359. *Operations Research for Public Administrators.* 3 hr. Examination of role of quantitative analysis in public administration and decision-making.

360. *Human Factors System Design.* 3 hr. PR: I.E. 260 or consent. Theoretical aspects and practical applications of man/machine relationships as they influence future system design. The student will examine human limitations with respect to acceptance of information, decision making, and ability to transmit the result of such decisions to controlled equipment systems to obtain design optimization. 2 hr. rec., 3 hr. lab.

361. *Industrial Hygiene Engineering.* 3 hr. Introductory course in industrial hygiene legal standards, historical context, and development. Topics include respiratory physiology, particle size and deposition, ionizing and nonionizing radiation, physical stress, solvents, metals, pesticides, painting, welding, and degreasing.

362. *Systems Safety Engineering.* 3 hr. PR: I.E. 261 or consent. Analysis of manufacturing methods, processes, and properties of materials from a system safety engineering viewpoint. Emphasis will be on hazard analysis techniques (fault tree, MORT, failure modes and effects) and machine guarding methods.

364. *Industrial Ergonomics.* 3 hr. PR: I.E. 260 or consent. Practical experience in the application of ergonomic principles to industrial problems. Safety and production implications of work physiology, industrial biomechanics, and circadian rhythms, as well as current interest topics.

368. *Advanced Problems in Human Factors.* 1-3 hr. PR: I.E. 260 or 360 and graduate standing. Special problems relating to one of the areas of human factors, such as simulation, controls, vigilance, safety, and occupational health.

377. *Advanced Engineering Economy.* 3 hr. PR: Consent. Special emphasis on depreciation, engineering and economic aspects of selection and replacement of equipment; relationship of technical economy to income taxation; effect of borrowed capital and pricing model.

381. *Integrated Data Processing.* 3 hr. PR: I.E. 281 and consent. Advanced work in electronic data-processing systems and procedures design. Case studies of integrated data-processing systems. Course projects will include individual use of a computer in management data-processing analysis problems.

451. *Nonlinear Programming.* 3 hr. PR: I.E. 250 or consent. Advanced study of the techniques of nonlinear programming and their applications. Topics include steepest descent, Newton's method, Fletcher-Powell, conjugate gradients, Powell's method, and penalty function methods.

452. *Queueing Theory.* 3 hr. PR: I.E. 113 and 250 or consent. Analytical modeling of waiting line systems with emphasis on determining the best operating conditions for those systems. Single-channel and multi-channel models. Computational methods (including Monte Carlo techniques) are examined. Applications to problems such as maintenance and inventory control.

453. *Theory of Linear Programming.* 3 hr. PR: I.E. 250 or consent. Study of procedures available for solving large-scale problems using linear programming. Topics include decomposition techniques, multiple pricing, cycling, inverse generation and storage, ranging procedures, and upper bound algorithms.

454. *Inventory Theory.* 3 hr. PR: I.E. 113 and 250 or consent. Techniques used in optimization of inventory systems. Elements of static, deterministic inventory models, and static, stochastic inventory models. Dynamic inventory models. Selected topics related to inventory analysis.

455. *Probability Theory for Engineers*. 3 hr. PR: I.E. 113 or consent. Probability theory and its application to industrial systems with particular emphasis on inventory, queueing, maintenance, reliability, and quality control systems. Markov processes are covered.

456. *Applied Stochastic Processes*. 3 hr. PR: I.E. 455. Stochastic systems with emphasis on application to inventory and queueing theory. Conditional probability, Poisson processes, counting processes, renewal processes, Markov chains with discrete and continuous parameters.

457. *Dynamic Programming*. 3 hr. PR: I.E. 250 or consent. Introduction to basic structure and computational aspects of dynamic programming and applications including sequential decision problems, deterministic and probabilistic models over finite and infinite planning horizons, and Markovian decision processes.

458. *Integer Programming and Applied Networks*. 3 hr. PR: I.E. 250 or consent. Introduction to application of integer programming and maximum flow networks to engineering and operations research problems. Emphasis on problem formulation and solution.

480. *Seminar*. 1-6 hr. PR: Consent. Discussion of research in industrial engineering and special problems.

484. *Advanced Digital Simulation*. 3 hr. PR: I.E. 284 or consent. Analysis and comparison of special purpose digital simulation languages such as GPSS, SLAM, SIMAN, SIMSCRIPT, CSMP, DYANOMO, and JOB SHOP simulation.

497. *Research*. 1-15 hr.

INDUSTRIAL AND LABOR RELATIONS

Jay H. Coats, Director of Graduate Programs

333 Business and Economics Building

Office of Graduate Programs, College of Business and Economics,
West Virginia University, P.O. Box 6025, Morgantown, WV 26506-6025

Telephone: (304) 293-5408

Degrees Offered: Master of Science

Industrial and Labor Relations Areas of Emphasis available for:

Doctor of Philosophy

Graduate Faculty: Members Elkin, Schaupp, and Zeller. Associate Members Brown, Bucklew, Decker, Grasso, Humphreys, Miller, Remington, Smith, and Tapper.

The Department of Industrial and Labor Relations offers a master of science in industrial and labor relations (ILR). The AACSB-accredited program of study prepares students for professional positions in human resources (employee relations) and labor relations. Course work can be structured to prepare students for doctoral studies in industrial and labor relations, economics, management, or law.

The department operates, in conjunction with the Department of Economics, an industrial and labor relations Ph.D. option. M.S. students who plan to pursue the industrial relations option in the Ph.D. program in economics should align their master's work with the degree requirements.

Entry-level professional opportunities for ILR graduates include such positions as employee relations associate, assistant personnel manager, human resources administrator, labor relations representative, professional research analyst, compensation analyst and benefits administrator. Other positions include staff representative with organized labor, apprentice arbitrator, labor-management consultant, National Labor Relations Board field examiner, government employee relations representative, and employ-

ment analyst. Most graduates are employed by Fortune 500 companies. Some find positions with organized labor, all levels of government, and advocacy organizations. The department, in conjunction with the WVU Career Services Center, makes a concerted effort to place graduates in positions that fulfill student job objectives.

The curriculum is a blend of theory, analysis, and pragmatism. Core course work serves two purposes: to provide in-depth knowledge and skills pertaining to the human resource and labor relations functions of organizations, and to acquaint students with the operation of the other organizational business functions. A substantial number of elective courses allows the student to tailor the curriculum to meet particular career goals and interests. More than 50 faculty members in a dozen departments offer course work and/or conduct research in the human resources and ILR areas.

Students are encouraged to participate in academic-related extra-curricular activities. Many are co-sponsored by the Industrial Relations Student Association: the *ILR Newsletter*, resume mailings, social events, and honors banquets. Outstanding academic achievement is recognized by membership in the Industrial Relations Honor Society. The faculty makes Outstanding ILR Student awards yearly to two persons selected on the basis of scholarship, informal leadership and extracurricular activities.

Financial aid. A limited number of graduate assistantships and tuition scholarships are available on a competitive basis. Major selection criteria include the applicant's grade-point average in prior academic work and the GMAT or GRE score. Graduate assistants are paid a cash stipend during the regular semesters that is competitive in amount with that offered by other universities; they are assigned to faculty members to assist in research, teaching and other academic endeavors. Additional scholarships are available on a competitive basis to minority students. Additional information and application forms can be obtained from the Director of Graduate Programs.

GOALS. Graduate Opportunities for Advanced Level Study (GOALS) is the minority recruiting program of a national consortium of ILR schools. Minority students admitted to WVU's ILR program are eligible to compete for full fellowships offered by GOALS.

Academic Common Market. The master of science program in industrial and labor relations is an Academic Common Market program. Residents of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, South Carolina, Tennessee, Texas, or Virginia who are admitted to the M.S. ILR program can pay tuition at West Virginia University's in-state (resident) rates.

Admission. The master of science in industrial and labor relations is interdisciplinary in nature and no specific undergraduate major is required. Course work in computer science, labor economics, statistics, and business disciplines is helpful. Admission is competitive and on a space-available basis.

To gain admission into the program, an applicant must have a bachelor's degree (in any field) from an accredited college or university and a grade-point average of at least 3.0 (either overall or on the last 60 credit-hours of undergraduate and/or graduate work completed). In addition, the applicant must have a Graduate Management Admission Test (GMAT) score of at least 500. Applicants with a GPA below 3.0 (or a GMAT below 500) must show a correspondingly higher GMAT (or GPA) achievement. Equivalent scores on the Graduate Record Exam (GRE) are also acceptable. International students must also submit a satisfactory TOEFL score.

Although not required, applicants may wish to send additional supportive material, including letters in support of their application, reference letters, a resume of work experience, and an example of written work.

Students may enter the graduate program in any semester/session. Application deadlines are one month before the start of classes in the term for which admission is sought. Later applications, while acceptable, may diminish the chances for admission due to the graduate class being filled. Since no admission decision can be made without the applicant's GMAT or GRE score being submitted, applicants should keep in mind the GMAT or GRE test schedule.

Institute of Industrial and Labor Relations

The mission of the Institute of Industrial and Labor Relations (IILR) is to coordinate instruction, research, and public service activities, which embrace a study of the elements of human resources development uniquely identified with the economy of West Virginia. Membership is open to faculty who have an interest in the mission of the IILR.

The IILR serves as a means of rational response to economic trends based on an amalgamation of the three University functions: faculty/student research on a continuing basis in search of human resource development possibilities; use of research results in credit instruction to produce a growing cadre of graduates aware of and trained to be able to contribute to the state's economic goals; and, using both of the former, extension and public service efforts designed to place the state's human resource development and use activities on their most economically rational courses.

Master of Science in Industrial and Labor Relations

The master of science in industrial and labor relations has a two-part core. The total length of the program will not be greater than 47 semester hours nor less than 42 hours. Program length depends upon the composition of course work taken as an undergraduate.

ILR Core

The required ILR core classes are designed to provide a solid, multidisciplinary foundation of ILR theory and practice. ILR 314 presents an overview of ILR theory, practice, and issues from a management perspective. Its counterpart is ILR 316, which covers the same subjects from the perspective of organized labor. In ILR 312 the concepts of industrial psychology are applied to ILR. An eclectic view of collective bargaining and labor relations complete the sequence (ILR 262).

The 12 hours of required ILR core are:

	Hr.
ILR 262—Collective Bargaining and Labor Relations	3
ILR 312—Organizational Theory, Behavior and Communication.....	3
ILR 314—Industrial Relations Strategy and Policy	3
ILR 316—Labor Organization Industrial Relations	3

Common Body of Knowledge (CBK) Core

Industrial and labor relations functions are not separate from other organizational activities. Firms, labor organizations, and government units integrate ILR with their management, business law, economics, accounting, finance, and marketing activities. The common body of knowledge (CBK) core is designed to provide ILR students with the common body of knowledge

necessary to these functions. They also include skills classes in computer hardware and software, management information systems, and integrative policy formulation. Students who have acquired equivalent knowledge of these areas as undergraduates may waive up to 5 hours of this functional core. If equivalent undergraduate course work exceeds 5 hours, ILR elective course work will be substituted for CBK core hours.

Program length may vary between 42 and 47 semester hours. Students who have no CBK background will complete a 47 credit-hour program. Those with equivalent course work may waive up to 5 hours of graduate requirements, resulting in a 42 credit-hour program. The CBK core is as follows:

	Hr.
Acctg. 311—Financial Accounting for Decision Making	3
B. Law 311—Legal and Regulatory Environment	2
Econ. 317—Economic Decision Making	2
Fin. 311—Managerial Finance	2
Manag. 301—Organization Behavior and Ethics	3
Manag. 311—Management Information Systems	3
Manag. 321—Operations Management/ Applied Quantitative Analysis	3
Manag. 351—Policy and Strategy	3
Mrktg. 311—Marketing Management	2

The remaining hours will be chosen from the following courses after consultation with the adviser. While the listed courses are preferred, considerable latitude may be given the student by the adviser to choose other courses which are particularly appropriate to the student's background and interest. Approval must be obtained in advance. No more than three elective hours may be taken at the 200 level. Electives may be chosen from the following:

	Hr.
<i>Industrial and Labor Relations</i>	
301—Industrial Relations Analytical Techniques 1	3
302—Industrial Relations Analytical Techniques 2	3
330—Compensation Issues	3
332—American Trade Unionism	3
333—Seminar: Quality of Work Life	3
334—Work Group Dynamics and Leadership	3
337—Practicum in Industrial Interviewing	3
340—Arbitration Theory and Practice	3
342—Advanced Collective Bargaining	3
344—Benefits	3
345—Equal Employment Opportunity Problems	3
491A—Advanced Study	1-6
491B—Advanced Study: Practicum in ILR	3
<i>Management</i>	
217—Personnel and Compensation	3
218—Focal Points in Management	1-3
325—Organizational Design	3
349—Seminar in Management	3
<i>Business Law</i>	
211—Personnel Relations and the Law	3
311—Legal and Regulatory Environment	3
<i>Sociology and Anthropology</i>	
204—Complex Organizations	3
233—Sociology of Work and Work Places	3
375—Fundamentals of Gerontology	3

	Hr.
Economics	
211—Micro Economic Analysis	3
212—Macro Economic Analysis	3
310—Advanced Micro Theory 1	3
312—Advanced Macro Theory 1	3
318—Economic Policy	3
340—Public Finance	3
360—Advanced Human Resource Economics	3
364—Seminar in Labor Economics	3
Public Administration	
341—Administrative Organization and Management	3
343—Public Personnel Administration	3
348—Legal/Political Foundation of Public Administration	3
443—Public Sector Labor Relations	3
448—Legal Environment	3
Industrial Engineering	
222—Job Evaluation and Wage Incentives	3
260—Human Factors Engineering	3
261—System Safety Engineering	3
361—Industrial Hygiene Engineering	3
362—Systems Safety Engineering	3
Law	
360—Compensation Law	3
391—Arbitration	3
391—Public Sector Labor Law	3
391—OSHA	3
391—Civil Rights	3
391—Labor Law 1	4
391—Labor Law 2	2
Counseling	
301—Fundamentals of Counseling	3
320—Vocational Development and Occupational Choices	3
Rehabilitation Counseling	
312—Psychological Aspects of Disability	3
320—Vocational Development and Occupational Choices	3
Computer Science	
301—Computers in Research	3

The industrial relations program requires that the student maintain a grade-point average of at least 3.0 on all work taken as a graduate student while enrolled in the College of Business and Economics. In addition, the student must maintain a 3.0 average in all work counting toward the graduate degree. A student whose cumulative grade-point average falls below 2.75 will be placed on probation. If the student's average is not brought up to 2.75 by the end of the following semester, the student will be suspended from the program. A grade below C in any course taken while enrolled as a graduate student will result in suspension from the program.

Industrial Relations Ph.D. Option

Graduate work in industrial relations typically is interdisciplinary in nature. The Ph.D. option retains this orientation while providing students with a Ph.D. level of understanding of economic theory and economic analysis. Students in the industrial relations option take the eight core courses in the Ph.D. in economics program, take comprehensive examinations

in microeconomic theory and macroeconomic theory, and follow the rules and requirements for obtaining the economics Ph.D.

Students are required to complete three fields of concentration. One field must be industrial and labor relations, which consists of the following courses:

ILR 334—Leadership and Work Group Dynamics

ILR 342—Advanced Collective Bargaining

ILR 491A—Practicum in Research Methods

ILR 491B—Research Theory

Of the two remaining fields, each typically 6 credit hours, one must be from within the Department of Economics. Most commonly, this field is labor economics. The other field may be selected from economics, industrial psychology, public administration, statistics, human resources management, industrial engineering, or law, and ideally should complement the student's research interest.

Students must pass written comprehensive examinations in their three fields of concentration.

Industrial and Labor Relations (ILR)

262. *Collective Bargaining and Labor Relations.* 3 hr. Examination of the theory and practice of collective bargaining. Topics include economics and historical environment, labor law, unionization, contract negotiation, patterns in contract content, conflict resolution, grievance handling, and an introduction to arbitration.
301. *Industrial Relations Analytical Techniques 1.* 3 hr. PR: Admission to the ILR graduate program and C.S. 5 or equiv. Introduction to the software and hardware appropriate for use in human resource applications, emphasizing efficient and effective use of previously developed software. Introduction to quantitative analytical decision-making techniques.
302. *Industrial Relations Analytical Techniques 2.* 3 hr. PR: Admission to the ILR graduate program. Further development of the quantitative analytical techniques and of business information systems used in the human resources field. Emphasis on quantitative decision-making and information systems in an industrial relations setting.
311. *Management Information Systems.* 3 hr. PR: Consent. Examines computer technology, applications, information systems, and performance. Computer system planning, selection and implementation. Computer impact upon management, organization and society from a managerial viewpoint.
310. *Human Resources Economics.* 3 hr. PR: Admission to the ILR graduate program. Consideration of the conditions of employment and unemployment at both macro and micro levels under varying degrees of competition, including the process of labor force preparation, labor market data and policy.
312. *Organizational Theory, Behavior, and Communication.* 3 hr. PR: Consent. Emphasis on the communication processes involved in problem resolution including organizational decision making. Problems include organizational evaluation methods, training and leadership development, staffing, evaluation of proficiency of individuals, systems, and procedures.
314. *Industrial Relations Strategy and Policy.* 3 hr. PR: Consent. Explores the integrative dimensions of organizational policies and their relationship to the personnel and industrial relations function. Business ethics in the industrial relations function.

316. *Labor Organization Industrial Relations*. 3 hr. PR: Consent. Introduction to dynamics (adversary/cooperative) of industrial relations from a union viewpoint. Topics include conflict resolution, union government, alternatives to economic conflict bargaining, interaction, the state of industrial relations and work society.

330. *Compensation Issues*. 3 hr. PR: Consent. Seminar in compensation designed to develop further understanding of compensation theory and practice. Topic areas will include labor supply, wage theory, legal constraints, motivation, equity theory, organizational development as well as compensation structure and administration.

332. *American Trade Unionism*. 3 hr. PR: ILR 262 or 316 or consent. Examines the rise of American unionism and traces historical factors shaping its philosophy. Topics include economic conditions and union history, comparisons of AFL and CIO structures and the AFL-CIO as a government.

333. *Seminar: Quality of Work Life*. 3 hr. PR: Consent. Analysis of current trends and approaches in "quality of work life improvement" with special attention to developments in participative management, job enrichment and gain sharing. Results of current research are featured.

334. *Work Group Dynamics and Leadership*. 3 hr. PR: Consent. Small group or individual research on topics related to leadership and group dynamics in the work environment including training and other human relations programs.

337. *Practicum in Industrial Interviewing*. 3 hr. PR: I.R. 312 and consent. Experiential learning of industrial interviewing techniques covering legal and technical aspects of employment interviewing and other types of interviewing.

340. *Arbitration Theory and Practice*. 3 hr. PR: ILR 262 and consent. Study of the purpose of arbitration, trends, principles of contract construction, hearing procedure evidence, remedies, training and education of arbitrators, training of advocates, and decision writing. Students will arbitrate mock cases.

342. *Advanced Collective Bargaining*. 3 hr. PR: ILR 262 or consent. Development of the economic theory, empirical analysis and policy implications of the impact of collective bargaining on wages, employment, market structure, and prices.

344. *Benefits*. 3 hr. Considers employee benefits from the perspective of the industrial relations specialist who is responsible for articulating and administering a corporate program. Includes study of all benefits covered by major federal legislation.

345. *Equal Employment Opportunity Problems*. 3 hr. PR: Consent. A series of lectures by specialists in equal employment opportunity affairs. Lecturers will include attorneys, directors of state and national EEO agencies, and representatives of business and industry and the labor movement.

491. *Advanced Study*. 1-6 hr.

497. *Research*. 1-15 hr.

CBK Core Courses

Acctg.

311. *Financial Accounting for Decision Making*. 3 hr. PR: Consent. Basic accounting assumptions and standards underlying financial statements, the significance of financial statement measurements, and the relevance of such data for planning and control. Emphasis on financial statement and cash-flow analysis.

B. Law

311. *Legal and Regulatory Environment*. 2 hr. PR: Consent. Examination of the legal environment in which business decisions are made and the response of the legal environment to change. Familiarization with the role of administrative agencies in the regulatory process.

Econ.

317. *Economic Decision Making*. 2 hr. PR: Econ. 54 or consent. Analysis of the firm as an optimizing unit operating in the market place. Examination of product demand, production and costs, pricing theory and practices, risk, and capital budgeting.

Fin.

311. *Fundamentals of Finance*. 2 hr. PR or Coreq: Acctg. 311 or consent. Covers the basics of standard financial activities of the firm including: financial planning, the structure of financing, and asset selection.

Manag.

301. *Organization Behavior and Ethics*. 3 hr. PR: Consent. Interpersonal relationships through which administration becomes effective. Emphasis on human factors, but influences of economic and technological factors also are considered. Focus on ethics and importance of harmony between individual needs and organization goals.

311. *Management Information Systems*. 3 hr. PR: Consent. Examines computer technology, applications, information systems, and performance. Computer system planning, selection, and implementation. Computer impact upon management, organization, and society from a managerial point of view.

321. *Operations Management/Applied Quantitative Analysis*. 3 hr. PR: Consent. Review of concepts, techniques, and models encountered in manufacturing and service operations. Modeling approach and computer applications in operations management and management science are emphasized.

351. *Policy and Strategy*. 3 hr. PR: Consent. M.B.A. capstone course. Integrates functional knowledge with strategy formulation and strategy implementation concepts. Cases of organizations varying in size, national affiliation, and profit orientation are analyzed with special emphasis on ethics and social responsibility.

Mrktg.

311. *Marketing Management*. 2 hr. Introduction to marketing management with specific emphasis on consumer behavior and market segmentation, product planning, promotion, distribution, and pricing.

JOURNALISM

John H. Boyer, Director of Graduate Studies in Journalism
306 Martin Hall

Degree Offered: Master of Science in Journalism

Graduate Faculty: Members Boyer, Cremer, Ours, Paty, Sasser, Schreiber, and Seymour. Associate Members Findley, Pinnell, and Yagle.

The Master of Science in Journalism (M.S.J.) program in the Perley Isaac Reed School of Journalism has granted more than 160 degrees since its first, in 1962. The program is designed to help persons involved in the various aspects of mass communication better understand and cope not only with the increased complexity of their own field, but also with fields outside mass communication.

The program, designed to help each student reach full potential as a practitioner, teacher, or scholar in mass communication, helps prepare a student not only for a first job—although students who obtain the M.S.J. degree should excel in the skills of the profession—but also for long-term and productive career development through the study of mass communication and related fields.

The M.S.J. program is intended to afford the liberal arts graduate an opportunity to concentrate advanced study in mass communication; provide intensive study for persons who have undergraduate journalism training, but

who wish to pool their journalistic skills with extensive knowledge in another substantive area or areas (e.g., political science, economics, science); and give persons who have had considerable professional experience an opportunity to broaden their academic bases through carefully selected advanced studies.

Admissions and Advising

Admission to the M.S.J. program is limited to holders of baccalaureate or equivalent degrees from institutions of higher learning. Applicants should have combined verbal and quantitative scores on the Graduate Record Examination (GRE) aptitude test of at least 1000 and overall grade-point averages (GPA) of at least 3.0 on a 4.0 scale. Each applicant also should submit to the director of graduate studies in the School of Journalism a detailed essay explaining why the student wants to undertake graduate study in journalism, what the student hopes to get from the graduate journalism program, what the long-term goals are, and how graduate education in journalism can help achieve those goals.

An applicant who doesn't meet the minimum GRE and/or GPA requirement(s) may be accepted only if the low GPA or GRE scores are offset by other factors. Excellent recommendations, unusual grading patterns (e.g., a steady rise of grades), an outstanding statement of purpose, or examples of professional accomplishment sometimes can offset low GRE scores or a low GPA.

Students applying for admission to the M.S.J. program are encouraged to send nonreturnable supporting material to the director of graduate studies in the School of Journalism. Examples of published or unpublished writing, research, or photography, a detailed listing of professional media experience or other relevant job experience, and other supporting materials will be considered by the admissions committee. All other materials (e.g., transcripts, GRE scores, application forms) should be sent to the Office of Admissions and Records.

A student who does not have a bachelor's degree in journalism or extensive professional experience must meet these additional requirements:

1. Must have completed a core of journalism courses, with subjects and grades acceptable to the School of Journalism, or
2. Must complete undergraduate journalism and other courses to be prescribed by the School of Journalism, or
3. Must demonstrate knowledge and competence in a number of journalism topics to be prescribed by the School of Journalism, or
4. Must meet a combination of the foregoing requirements.

All applications for admission are considered by the director of graduate studies and one other member of the graduate studies committee (GSC). The entire GSC considers special cases and appeals.

The director of graduate studies advises all students about general problems and concerns, courses to take, projects to undertake, special training to obtain, and appropriate outside areas for study.

Early in the student's program, usually by the completion of 6-9 credit hours of graduate course work, the student and the adviser draw up a plan of study to show the direction of the student's course work. The plan may also indicate a general time frame anticipated for the completion of this work and may contain the direction and outline of the research problem to be undertaken. This plan of study becomes a part of the student's record, and constitutes, with some degree of specificity, the terms and conditions that the student must meet for completing the degree requirements. Subsequent changes in the plan of study must be approved by the student and the adviser,

and no graduate student may take a course S/U or Pass-Fail without written permission of the graduate director.

Graduate Assistantships and Internships

Approximately nine assistantships and internships are available in and through the School of Journalism each year. Graduate assistants teach laboratories and assist professors with their courses. Interns work in mass communication-related jobs on campus to obtain solid professional experience.

Students receive stipends for the academic year and may apply for tuition remission for the entire year. Although sometimes renewed for a second year, assistantships and internships are granted for one academic year. Graduate assistants and interns work an average of 15 hours per week during the academic year.

Persons who want to be considered for assistantships or internships should have their applications on file with the director of graduate studies in the School of Journalism before March 1.

Program Requirements

The School of Journalism offers two tracks—the teaching-research track and the professional track—within the M.S.J. program.

The teaching-research track is generally a program for persons who want to go on for a Ph.D. degree, teach in a community college, or conduct research in some areas of mass communication. Persons in the track normally take research and theory courses both inside and outside the School of Journalism, statistics, and social science courses. The program culminates in a thesis, which is a scholarly study of an important aspect of mass communication.

The professional track is designed primarily for persons who wish to become excellent practitioners in some field of mass communication and who have little desire to teach or become mass communication researchers. Persons in the professional track normally take communication and outside area courses that will help them become better practitioners. The program culminates in a professional project, which helps a student extend his or her knowledge about a given aspect of mass communication but which should be the sort of nonroutine project on which the student might work as a professional.

Students must complete all requirements for their degrees, including either a thesis or professional project within four years of the start of the first course work in their programs.

Course Work

For the master's degree in journalism, the student must meet the following requirements:

Teaching-Research Program. A minimum of 30 semester hours of acceptable graduate credit, including a thesis for 6 hours of credit.

(a) As part of the 30 hours, a minimum of 18 hours, including the thesis, in School of Journalism courses.

(b) Included in the 30 hours, a minimum of 9 hours in a minor conducted outside the School of Journalism.

Professional Program. A minimum of 30 semester hours of acceptable graduate credit, including a professional project for 6 hours of credit.

(a) As part of the 30 hours, a minimum of 18 hours, including the professional project, in School of Journalism courses.

(b) Included in the 30 hours, a minimum of 9 hours in a minor conducted outside the School of Journalism.

In either program, the candidate is allowed to take more than the minimum required number of hours.

The following courses are required for all Journalism graduate students: Journ. 300—Introduction to Graduate Studies (no credit); Journ. 304—Mass Media and Society (3 hr.); Journ. 320—Advanced Journalistic Writing and Research (3 hr.); and Journ. 401—Research Methods (3 hr.).

Upper-Level Courses Required. In both programs, 60 percent of the graduate credits submitted for the degree must be in courses numbered 300 or above.

Grades. Course work must be completed with a minimum grade-point average of 3.0. The thesis and professional project are graded as S or U (Satisfactory or Unsatisfactory).

Except for thesis, professional project, and internship courses, no student will be permitted to take a course on a Pass-Fail or Satisfactory-*Unsatisfactory* grade basis without prior approval of the Director of Graduate Studies.

Examination. The candidate for the master's degree will pass an oral examination on the thesis or professional project. In addition, the thesis or professional project will be evaluated as a test of the candidate's writing skill.

The kinds of courses taken in the M.S.J. program largely depend on each student's background and interests. The program is intended to accommodate students of differing academic and professional backgrounds and interests.

A student typically will take all outside courses in one area (e.g., biology, political science, history), although the student may decide after consultation with the adviser to take courses in two or more outside areas. Courses outside the School of Journalism are selected by students in consultation with their advisers; outside courses selected are subject to the availability of space and prerequisite requirements in the offering departments.

Thesis/Professional Project

Each student must complete a thesis or professional project involving original work in the student's area of interest. The student should have a thesis or professional project proposal written by the end of the semester in which the first 12 hours of course work are completed.

Each student is responsible for developing ideas for the thesis or project. Through consultations with members of the journalism faculty, the student determines faculty interests and areas of expertise, and ideas are refined to the point where the student has a significant and feasible idea in mind.

The student, with the approval of the Graduate Studies Committee, selects the journalism faculty member who would be best able to chair the advisory committee, subject to the agreement of the faculty member. If questions arise about a faculty member's interest or knowledge, the student directly asks the faculty member or consults the academic adviser or other members of the Graduate Studies Committee.

With the chairperson, the student further refines the idea to a "preliminary proposal" stage, in which ideas and appropriate methodology are on paper, but not necessarily in formal proposal form.

After the student has written a preliminary proposal and selected a faculty chairperson, the student should select other members of the advisory committee, subject to their willingness to serve. The advisory committee must consist of not fewer than four members, one from outside the School of Journalism; two persons must be members of the WVU graduate faculty.

At this point, students in the professional track must submit their proposals to the Graduate Studies Committee, which must approve all

professional project topics (but not research methods, specific research questions, or hypotheses, etc.). Students may attend the meetings at which their proposals are discussed. After securing Graduate Studies Committee approval, students in the professional track schedule hearings with their guidance committees. Hearings with the guidance committees are required of all students (including those in the teaching research track).

Working under the guidance of the advisory committee, the student prepares a complete thesis or project proposal, extended from the preliminary proposal. Guidance for preparing a proposal is available from the director of graduate studies.

The student then has a consultative meeting, during which final revisions of and refinements in the proposal are discussed with the members of the advisory committee. Notices of the public meeting (to which students are invited) must be placed in the boxes of all members of the School of Journalism faculty and posted outside the dean's office at least two weeks before the meeting. One copy of the thesis or project proposal must be placed on reserve in the journalism reading room.

After the consultation, the committee votes to accept or reject the proposal. The student whose proposal is approved works closely with the committee in the completion of the thesis or project. All committee members should be kept informed and consulted for advice (as needed and as desired by them) as the thesis or project develops.

After each member of the advisory committee is satisfied with the work, a public oral examination is scheduled. Two weeks' notice must be given to all faculty of the School of Journalism (notices should be placed in all faculty boxes and posted outside the dean's office). One copy of the final thesis or project must be placed on reserve in the journalism reading room. Students also should make certain their shuttle sheets are filed with the Director of Graduate Studies in Journalism two weeks before the date of the oral defense.

Only committee members may vote on acceptance or rejection of a thesis or project. A majority vote is sufficient to approve the thesis or project, although a dissenting vote may be recorded. Furthermore, at least three signatures (two of which must be signatures of graduate faculty members) must be on the approval sheet. If one committee member is outvoted and feels he/she cannot sign the approval sheet, he/she may resign from the committee. Such action may force a reconstitution of the committee and repetition of earlier mentioned steps leading to the oral examination.

The chairperson of the advisory committee will decide whether final corrections (after the oral examination) have been made properly, and he/she will check the style and form of the final typed version. The *MLA Stylesheet* or other approved stylebook should be carefully followed during preparation of a thesis or professional project.

Four copies of the final thesis or two copies of a project should be delivered to the School of Journalism.

Maintenance of Scholarship

All students are expected to maintain satisfactory progress toward the degree. A student's graduate record begins with the first course credited to the degree and includes all subsequent courses. All students must maintain a grade-point average of at least 3.0 and complete all requirements within four years. Students who fail to meet this standard will be dropped from the program permanently.

Each student working toward the M.S.J. degree must register for at least one semester hour each regular (Fall and Spring) semester. This enrollment may be in course work or in Journ. 497.

Foreign Students

Believing that mutual benefit is derived when students from other countries study in the WVU School of Journalism, the school welcomes foreign students. At the same time, the school recognizes that journalism, more than many other fields, requires language skill. To profit by journalism study, foreign students must have a ready understanding of English. They will be called on to follow rapid speech in interviews, press conferences, public addresses, and in the classroom, as well as to deal with abstract ideas communicated in English. Award of the master's degree in journalism attests to the student's facility in English. Foreign students must maintain the same 3.0 grade-point average required of other students.

Recognizing the language difficulty, the School of Journalism offers foreign students a transition semester. Unless students obviously are fluent in English and pass a test in which they demonstrate comprehensive knowledge of English fundamentals (grammar, punctuation, syntax, spelling), they will be offered a semester of undergraduate study (not for graduate credit), which will enable them to sharpen language skills. Such a transitional semester also will permit foreign students to study other selected courses in preparation for graduate study. These courses will help them adapt to the American system of journalism and to the new cultural environment.

Journalism (Journ.)

- 221. *Mass Communications Research Methods.* 3 hr. PR: Journ. 1, 15; and Journ. 18, or PR 111, or Adv. 113 or BN 117. A broad study of scientific and critical research methods as they apply to mass media practices; review of relevant sources for historical data gathering, readership and audience analysis; evaluation of marketing and public opinion research. 2 hr. lec., 1 hr. field work.
- 231. *Color Photography. II.* 3 hr. PR: Journ. 120 and 130 or consent. The theory of color slides and prints, including slide development, as applied to multi-media presentations. (Supplies will cost \$50.00-70.00)
- 241. *Internship.* 3 hr. PR: Foundation courses in one of the sequences. Student must have a signed contract detailing terms of the learning experience. Full-time employment for a minimum of 10 weeks. (Graded on Pass/Fail basis.)
- 242. *Practicum.* Journalism majors only. 1-2 hr. PR: Foundation courses in one of the sequences. Student must have a signed contract detailing terms of the learning experience. 8-20 hours per week for minimum of 10 weeks, while taking other courses. (Graded on Pass/Fail basis.) (1-2 hr. work experience.)
- 299. *Contemporary Media Issues and Ethics. I, II.* 2 hr. (Required of all senior journalism majors.) In-depth study of contemporary media issues such as right of access to media, morality in news and advertising, new FTC and FCC regulations, media responsibility to society, and social responsibility of media professionals. Individual research papers on issues with ethical considerations.
- 300. *Introduction to Graduate Studies. I.* (No Credit.) (Required of all graduate journalism students.) Designed to orient students to graduate study. (Class meets once a week.)

304. *Mass Media and Society*. II. 3 hr. (Required of all graduate journalism students.) Study of mass media and their role in and influence on society; includes analysis of the social, political, and economic determinants of media content and character.

312. *Fund Raising and Foundation Management*. I. 3-6 hr. (Open to graduate journalism students and to seniors with a 3.0 grade-point average; consent.) Seminar. Studies in fund raising, alumni relations, and foundation management.

320. *Advanced Journalistic Writing and Research*. I, S. 3 hr. (Required of all graduate journalism students.) Study of advanced journalistic writing and research techniques. Students will practice the writing and research techniques on topics of their own choosing. Academic or popular topics may be selected.

340. *Corporate Communications*. I. 3 hr. Conferences to examine the synergistic effects of advertising, journalism, and public relations for different kinds of corporations. Team projects and presentations.

341. *Special Topics*. I, II, S. 1-6 hr. Student proposes idea for substantial reading, research, writing in area of interest; requirements may include conventional term paper, series of articles, slide presentation, oral presentations, etc. Student works independently of classroom setting.

380. *Thesis*. I, II, S. 2-6 hr. PR: Approved thesis proposal.

390. *Professional Project*. I, II, S. 2-6 hr. PR: Approved professional project proposal. Non-thesis professional project for students preparing for some field in mass communication.

401. *Research Methods*. I. 3 hr. (Required of all graduate journalism students.) Study of quantitative methods common to research in communications. An introduction to sampling, measurement, analytic procedures, and data.

402. *Seminar in Research Problems*. II. 3 hr. Advanced study of methodological techniques. Research project chosen from area of student's major interest. A written report of the study undertaken is required.

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

497. *Research*. I, II, S. 1-15 hr. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

Advertising (Adv.)

201. *Retail Advertising*. I, II. 3 hr. PR: Adv. 115, 203, and admission to the School or consent. Strategic advertising planning for retail merchants. Writing ads to meet objectives. Sales management and sales of local advertising time and space. Exercises in newspaper, radio, TV, direct marketing, outdoor advertising, specialty advertising, etc.

203. *Advertising Media Analysis*. 3 hr. PR: Adv. 113 or consent. Survey of local and national advertising media. Identification and use of standard media resources. Creating media plans based on advertisers' strategic plans. Introduction to computer media planning.

210. *Graphic Design*. II. 3 hr. PR: Adv. 110 or consent. Design layouts for print media. Includes buying, supervising, and scheduling of art, typography, and print material. 2 hr. lec., 2 hr. lab.

239. *Seminar in Advertising Management Problems*. I, II. 2 hr. PR: Senior standing and major or minor in advertising. Application of the study of advertising research, law, and theory in the preparation of a national advertising campaign. Aspects of the campaign to cover marketing, research, creative, media, sales promotion, and presentation.

251. *Direct Marketing*. II. 3 hr. PR: Adv. 113 and 114 or consent. Mailing, marketing, and creation of direct-mail letters, brochures, involvement pieces, and reply cards. Postal regulations, direct mail law, and printing procedures.

259. *Advertising Campaigns*. 3 hr. PR: Adv. 203, senior standing or consent. Students work in teams to build complete advertising campaigns. Campaigns may include simulated local stores and major national businesses. Evaluations will be based on the professionalism of all facets of the campaigns.

Broadcast News (BN)

285. *Special Topics in Broadcast Journalism*. I, II, S. 1-3 hr. PR: BN 186 and consent. Directed investigation of selected topics in broadcast journalism.

287. *Broadcast Journalism 2*. I, II. 3 hr. PR: BN 186 and consent. Continuation of Journ. 185, with course content oriented to television news, including electronic news gathering (ENG).

News-Editorial (N-E)

220. *Writing for Magazines*. I, II, S. 3 hr. PR: Upper-division or graduate standing; Journ. 15 or equivalent preparation in grammar, punctuation, and spelling. Professional approach: magazine analysis, query letters, writing, rewriting; submitting manuscripts for publication.

225. *High School Publications Advising*. II. (Alternate Years.) 3 hr. PR: Journ. 18, 19, Adv. 113. (For students seeking Journalism certification.) Emphasizes writing styles, newspaper/yearbook layout, rights and responsibilities of the teacher, students, and school system. Enrollees will construct instructional portfolios based on research and classroom discussion concepts.

227. *History of Journalism*. I. 3 hr. PR: Hist. 52 and 53 or consent. (Open to all University students.) Impact of the American press on the nation; development of today's media from the beginnings in seventeenth-century England and in the American colonies; great names in journalism; freedom of press and its current implications.

228. *Law of the News Media*. II. 3 hr. (For seniors and graduate students.) The law as it affects the mass media. Considered are such areas as libel, public records, criminal pre-trial publicity, freedom of information, obscenity.

230. *Editorial and Critical Writing*. I. 3 hr. (Open to all University students.) The student will analyze and write editorials and commentaries; study typical editorial pages and the ethics governingtions Case Studies. II. 3 hr. PR: PR 124. Seminar based on in-depth studies of public relations programs developed and applied in support of our institutions. Primary emphasis on successful campaigns, but unsuccessful efforts also will be examined for causes of failures.

LIBERAL STUDIES

Marilyn Bendena, Director
317A Chitwood Hall

Degree Offered: Master of Arts in Liberal Studies

This interdisciplinary program provides an opportunity for highly motivated students to continue their studies beyond the baccalaureate under a coherent program but without the exclusive concentration in one discipline.

Each student, in conjunction with a graduate adviser, will put together a personalized curriculum centered around some topic or interdisciplinary area of special interest to the student. Topics might include area studies (e.g., Appalachian studies, women's studies, American studies), period studies (e.g., the history, literature, art, and philosophy of the eighteenth century), or some other special interest that will tie together studies in several different disciplines. The central theme is essential to the degree program to provide coherence and structure; a degree will not be awarded for an unrelated collection of courses. The focus provided by a central topic will ensure that studies are pursued in depth and justify the granting of a graduate degree.

Program Faculty

There are more than 750 graduate faculty members at WVU who can be called upon to assist students in their individual plans of study. The program is administered by the Master of Arts in Liberal Studies Committee, which is appointed by the Dean of Arts and Sciences and is responsible for admitting candidates to the program, approving study contracts, overseeing the final evaluation, and determining whether degree requirements have been met. This committee serves roughly the same administrative function for the Master of Arts in Liberal Studies (M.A.L.S.) as an academic department serves for more traditional degree programs.

Admission Requirements

Requirements for admission to the M.A.L.S. program:

1. Baccalaureate degree from an accredited institution.
2. Minimum undergraduate grade-point average of 3.0. Probationary status may be granted for those who do not meet this standard.
3. An essay of at least 1,000 words including: (a) a description of the student's relevant professional experiences, current orientation, and future goals, and an indication of how these goals will be served by the M.A.L.S. program, and (b) an outline of the course of study to be pursued, including the central focus of the study and a preliminary identification of course work to be taken, as well as an indication of how the courses are related to this central topic. The essay is an important admission criterion; it should demonstrate motivation and direction as well as mastery of essential writing skills. It also helps to determine which faculty member would be the most appropriate adviser.

Study Contract

Upon admission to the program, the student is assigned an adviser. With the assistance of the adviser, the student works out a detailed study contract, including a list of all course work to be taken, a description of the final project, and an indication of the relevance of the course work to the central topic of the degree proposal. The contract must be approved by the M.A.L.S. before the applicant is admitted to the program. A master's committee will then be

drawn from the appropriate graduate faculty to assist the student in the course of study.

Degree Requirements

Besides the general requirements listed in the graduate catalog for all graduate programs at WVU, the M.A.L.S. program has the following specific requirements:

1. A minimum of 36 semester hours of approved course work, subject to the following restrictions: a. Ordinarily no more than 12 hours will be approved for graduate course work taken before admission to the program; b. Because the degree is intended to be interdisciplinary no more than 18 hours can be taken in one departmental discipline; c. No more than 12 hours of independent study will be approved; d. The final 12 hours must consist of WVU course work; e. The program must include at least three hours of course work in research methodology.
2. A minimum 3.25 grade-point average for all course work in the degree program.
3. Fulfillment of all requirements of the study contract.
4. Successful completion of a *final project* (e.g., a comprehensive examination, project paper, performance or research project). When the student's final project does not include a comprehensive examination, a written document summarizing and synthesizing the student's graduate experiences in relation to the chosen topic must be submitted to the student's master's committee.

MATHEMATICS

James Lightbourne, Chairperson of the Department
208 Eiesland Hall

Degree Offered: Master of Science, Doctor of Philosophy
Graduate Faculty: Members Christie, Ciesielski, Diamond, Ganser, Gingold, Goldwasser, Goodykoontz, Gould, Hattori, Irwin, Johnson, Kim, Lai, Li, Mays, Moseley, Nadler, and Zhang. Associate Members Dowdy, Karwowski, Lightbourne, Mayes, Miller, Randolph, and Simons

The Department of Mathematics offers the master of science (M.S.) and doctor of philosophy (Ph.D.) degrees. Programs are available for students to study applied mathematics, pure mathematics, mathematics combined with another discipline, or mathematics for secondary education. Career opportunities are wide-ranging and include positions in education, industry, and government.

Students entering the M.S. program should have the equivalent of the mathematics requirements for an undergraduate major at WVU. Deficiencies may be remedied by the completion of recommended undergraduate courses or by examination. Such remedial work cannot be used to meet the degree requirements. Between 30 and 33 hours of approved coursework and either a thesis, project, or a comprehensive final examination are required. Students are expected to maintain at least a 3.0 average in mathematics courses and in work offered in fulfillment of the degree program.

To enter the Ph.D. program, the equivalent of an M.S. from WVU is necessary. Students must pass entrance exams in mathematics within the first year of study. Following the entrance exams, 30 hours of course work is required, consisting of 12 hours in a major area, six hours in each of two minor areas, and six hours of graduate seminar. Oral and written qualifying

examinations are taken in the major and minor areas of study. Upon successful completion of the course work, a thesis must be written based upon the student's original research in an area of mathematics.

For a more complete statement of the requirements of each degree, the student is referred to the department's graduate student handbooks.

Mathematics (Math.)

- 213. *Partial Differential Equations.* II. 3 hr. PR: Math. 18 or consent. Introduces students in mathematics, engineering, and the sciences to methods of applied mathematics. First and second order equations, canonical forms, wave, heat and Laplace's equations, representation of solutions.
- 215. *Applied Modern Algebra.* II. 3 hr. PR: Consent. Finite fields, algebraic coding theory, Boolean algebras, monoids, finite state, and Turing machines.
- 217. *Applied Mathematical Analysis.* II. 3 hr. PR: Math. 18. The algebra and differential calculus of vectors, solution of the partial differential equations of mathematical physics, and application of functions of a complex variable.
- 219. *Seminar in Applied Mathematics.* I, II. 1-12 hr. PR: Consent. Selected topics in applied mathematics. Topics previously offered include vector calculus and stochastic processes.
- 220. *Numerical Analysis 1.* I, II. 3 hr. PR: Math. 17 (or both Math. 16 and C.S. 120) and a programming language. Computer arithmetic, roots of equations, interpolation, Gaussian elimination, numerical integration and differentiation. Numerical solution of initial value problems for ordinary differential equations. Least square approximations. (Equiv. to C.S. 220.)
- 221. *Numerical Analysis 2.* II. 3 hr. PR: C.S. 220 or Math. 241 or consent. Solutions of linear systems by direct and iterative methods. Calculation of eigenvalues, eigenvectors, and inverses of matrices. Applications to ordinary and partial differential equations. (Equiv. to C.S. 221.)
- 224. *Mathematics of Compound Interest.* II. 3 hr. PR: Math. 16 or 128. A problem-solving course focusing on the measurement of interest, annuities, amortization schedules, and sinking funds, and the valuation of bonds and other securities.
- 226. *Mathematical Statistics.* II. 3 hr. PR: Math. 16 or consent. (Designed for mathematics teachers.) Frequency distributions, averages, probability, populations, samples, probability distributions, estimations, hypothesis testing. Although no previous knowledge of computer language is assumed, the computer will be used in this course.
- 228. *Discrete Mathematics 2.* II. 3 hr. PR: Math. 16 and 120 or equiv. Applications of discrete mathematics to computer science. Methods of solving homogeneous and non-homogeneous recurrence relations using generating functions and characteristic equations; digraphs to analyze computer algorithms; graph theory and its ramifications to computer algorithms. (Equiv. to C.S. 228.)
- 231, 232. *Introduction to Mathematics for the Elementary Teacher.* I, II. 3 hr. per sem. PR: Math. 34 or consent. (Not open to students who have credit for Math. 131.) (For in-service elementary mathematics teachers.) Systems of numeration; sets, relations, binary operations, the algebraic structure of various number systems; the notions of length, area, and volume; coordinate geometry.
- 241. *Applied Linear Algebra.* I, II, S. 3 hr. PR: Math. 17; Math. 18 or consent. Matrix algebra with emphasis on algorithmic techniques and applications of physical models. Topics include solution of large systems of equations, orthogonal projections and least squares, and eigenvalue problems.

251, 252. *Introduction to Real Analysis*. I, II. 3 hr. per sem. PR: Math. 163 or consent. A study of sequences, convergence, limits, continuity, definite integral, the derivative, differentials, functional dependence, multiple integrals, sequences and series of functions.

255. *Advanced Real Calculus*. S. 3 hr. Math. 18 or consent. Limits, series, metric spaces, uniformity, integrals.

256. *Complex Variables*. II. 3 hr. PR: Math. 18. Complex numbers, functions of a complex variable; analytic functions; the logarithm and related functions; power series; Laurent series and residues; conformal mapping and applications.

269. *Advanced Topics in Mathematics*. I, II. S. 3-9 hr. PR: Consent. An independent but directed study program, the content of which is to be mutually agreed upon by the individual student and instructor.

301, 302. *Combinatorial Analysis*. I, II. 3 hr. per sem. PR: One year of calculus. Permutations, combinations, generating functions, principle of inclusion and exclusion, distributions, partitions, compositions, trees and networks.

305, 306. *Theory of Numbers*. I, II. 3 hr. PR: One year of calculus. Introduction to classical number theory covering such topics as divisibility, the Euclidean algorithm, Diophantine equations, congruences, primitive roots, quadratic residues, number-theoretic functions, distribution of primes, irrationals, and combinatorial methods. Special numbers such as those of Bernoulli, Euler, and Stirling.

313. *Intermediate Differential Equations*. II. 3 hr. PR: Math. 17, 18. A rigorous study of ordinary differential equations including linear and nonlinear systems, self-adjoint eigenvalue problems, non-self-adjoint boundary-value problems, perturbation theory of autonomous systems, Poincare-theorem.

317, 318. *Advanced Calculus*. I, II. 3 hr. per sem. PR: Math. 18. Primarily for engineers and scientists. Functions of several variables, partial differentiation, implicit functions, transformations; line surface and volume integrals; point set theory, continuity, integration, infinite series and convergence, power series, and improper integrals.

319. *Seminar in Applied Mathematics*. 1-12 hr. PR: Consent. Selected topics in applied mathematics. Topics previously offered include applied linear algebra, computational fluid dynamics, numerical partial differential equations, ordinary differential equations, perturbation methods, and stochastic processes.

320. *Solution of Nonlinear Systems*. II. 3 hr. PR: C.S. 220 or Math. 241 or consent. Solution of nonlinear systems of equations. Newton and Secant Methods. Unconstrained optimization. Nonlinear overrelaxation techniques. Nonlinear least squares problems. (Equiv. to C.S. 320.)

330. *Introduction to Applied Mathematics*. S. 1-6 hr. PR: Calculus or consent. (Designed especially for secondary-school mathematics teachers; others admitted with departmental approval obtained before registration.) Problem solving and construction of mathematical models in the social, life, and physical sciences. Examples illustrating the origins and use of secondary school mathematics in solving real world problems.

333. *Modern Algebra for Teachers*. I, S. 3 hr. PR: Calculus or consent. (Designed especially for secondary-school mathematics teachers. Others admitted with departmental approval obtained prior to registration.) Introduction to algebraic structures: groups, rings, integral domains and fields. Development and properties of the rational and real number systems.

334. *Modern Algebra for Teachers.* II, S. 3 hr. PR: Math. 141 or 333 or consent. Further investigation of algebraic structures begun in Math. 333. (Emphasis on topics helpful to secondary-school mathematics teachers.) Topics include Sylow theory, Jordan-Holder Theorem, rings and quotients, field extensions, Galois theory and solution by radicals.

335. *Foundations of Geometry.* S. 3 hr. PR: Calculus or consent. (Designed especially for secondary mathematics teachers; others admitted with departmental approval obtained before registration.) Incidence geometrics with models; order for lines and planes; separation by angles and by triangles; congruence; introduction to Euclidean geometry.

336. *Transformation Geometry.* S. 3 hr. PR: Math. 141 or 333 or consent. (Designed especially for secondary-school mathematics teachers; others admitted with departmental approval obtained before registration.) A modern approach to geometry based on transformations in a vector space setting. The course unifies the development of geometry with the methods of modern algebra.

337. *Foundations of Probability and Statistics.* S. 3 hr. PR: Calculus or consent. (Designed especially for secondary-school mathematics teachers; others admitted with departmental approval obtained before registration.) Introduction to probability and statistics with emphasis on topics helpful to secondary-school mathematics teachers. Topics include: density and distribution functions, probability distributions, sampling, confidence intervals, point estimation, hypothesis testing, student's t-distribution. Chi-square distribution.

339. *Special Topics. I, II.* S. 1-12 hr.

341, 342. *Modern Algebra.* I, II. 3 hr. per sem. PR: Math. 141 or consent. Concepts from set theory and the equivalence of the Axiom of Choice. Zorn's Lemma and the Well-Ordering Theorem; a study of the strucuture of groups, rings, fields, and vector spaces; elementary factorization theory; extensions of ring and fields; modules and ideals; and lattices.

343. *Linear Algebra.* II, S. 3 hr. PR: Math. 241 or consent. Review of theory of groups and fields; linear vector spaces including the theory of duality; full linear group; bilinear and quadratic forms; and theory of isotropic and totally isotropic spaces.

351, 352. *Theory of Functions of Real Variables.* I, II. 3 hr. per sem. PR: Math. 181, 252. A development of the Lebesgue integral, function spaces and Banach spaces, differentiation, complex measures, the Lebesgue-Radon-Nikodym theorem.

355, 356. *Theory of Functions of Complex Variables.* I, II. 3 hr. per sem. PR: Math. 252. Number systems, the complex plane and its geometry. Holomorphic functions, power series, elementary functions, complex integration, representation theorems, the calculus of residues, analytic continuation and analytic function, Elliptic functions, Holomorphic functions of several complex variables.

357. *Calculus of Variations.* II. 3 hr. PR: Math. 18, 252, (or 318). Necessary conditions and sufficient conditions for weak and strong relative minimums of an integral, Euler-Lagrange equation. Legendre condition, field construction, Weierstrass excess function, and the Jacobi equation.

381, 382. *Topology.* I, II. 3 hr. per sem. PR: Math. 252 or consent. A detailed treatment of topological spaces covering the topics of continuity, convergence, compactness, and connectivity; product and identification space, function spaces, and the topology in Euclidean spaces.

385, 386. *Rings of Continuous Functions.* I, II, S. 3 hr. per sem. PR: Math. 341 and 381, or consent. A study of the algebraic structure of the ring of all continuous real-valued functions on a topological space and its relation to the topological properties of the space.

400. *Seminar in Number Theory*. I, II. 1-12 hr.

402. *Special Functions*. I, II. 3 hr. PR: Math. 18, 252. Operational techniques, generalized hypergeometric functions, classical polynomials of Bell, Hermite, Legendre, Noerlund, etc. Introduction to recent polynomial systems. Current research topics.

405, 406. *Analytic Number Theory*. I, II. 3 hr. per sem. PR: Math. 306, 356. Selected topics in analytic number theory such as the prime number theorem, primes in an arithmetical progression, the Zeta function, the Goldbach conjecture.

441, 442. *Group Theory*. I, II. 3 hr. per sem. PR: Math. 141 or consent. Elementary group theory; Sylow theory, extended Sylow theory in solvable groups, Burnsides theorem on normal complements, transfer homomorphism. Representation theory. Emphasis throughout on finite groups.

443, 444. *Algebraic Theory of Semigroups*. I, II. 3 hr. per sem. PR: Math. 342 or equiv. Ideal theory, matrix representation of semigroups, decompositions and extensions, simple semigroups, inverse semigroups, congruence relations, recent research.

451, 452. *Functional Analysis*. I, II. 3 hr. per sem. PR: Math. 181, 241, 252. A study of Banach and Hilbert spaces; the Hahn-Banach theorem, uniform boundedness principle, and the open mapping theorem; dual spaces and the Riesz representation theorem; Banach algebras; and special theory.

457, 458. *Theory of Partial Differential Equations*. I, II. 3 hr. per sem. PR: Math. 252. Cauchy-Kowalewski theorem, Cauchy's problem, the Dirichlet and Neumann problems, Dirichlet's principle, potential theory, integral equations, eigenvalue problems, numerical methods.

460. *Thesis*. I, II. 1-6 hr.

490. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of mathematics.

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of the student's program.

497. *Research*. 1-15 hr.

499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

MECHANICAL AND AEROSPACE ENGINEERING

Donald W. Lyons, Chairperson

323 Engineering Sciences Building

Degrees Offered: Master of Science in Mechanical Engineering
Master of Science in Aerospace Engineering

Mechanical and Aerospace Engineering Areas of Emphasis for:

Master of Science in Engineering
Doctor of Philosophy

Graduate Faculty: Members Bajura, Banta, Barbero, Celik, Clark, Dean, Dwivedi, Flemmer, Gautam, Johnson, Jurewicz, Kang, Kuhlman, Long, Loth, Lyell, Lyons, Means, Morris, Mucino, Napolitano, Norman, Palmer, Prucz, Shahnam, Sharan, Sivaneri, Smith, Sneedenberger, Squire, Stanley, Steinhardt, Upadhyay, and Venable

Faculty members in the department have extensive industrial and teaching experience and have published widely in the technical literature, a combination which assists students in selecting relevant courses and research

topics to meet their educational goals. The department has laboratory space on two floors in the Engineering Sciences Building and provides support for both instructional and research activities through the services of three shop facilities, the wind tunnel laboratory, and the flight test hangar at the Morgantown Municipal Airport (Hart Field). Funded research allows the department to maintain up-to-date instrumentation, equipment, and facilities, including computer-controlled data acquisition systems for laboratory use.

Graduate Programs

The objectives of the departmental graduate-level programs are: (1) To provide master's level education for students in or entering the engineering profession, and/or (2) To provide an advanced graduate educational experience for students pursuing the doctoral degree. Two separate master's degrees are offered in the department. They are the Master of Science in Aerospace Engineering (M.S.A.E.) and the Master of Science in Mechanical Engineering (M.S.M.E.). Master of Science in Engineering (M.S.E.) and the Doctor of Philosophy (Ph.D.) degree, an undesignated degree, is offered by the College of Engineering and is interdisciplinary in nature.

Graduate Degree Requirements

Course Work and Grade-Point Requirements

All of the degree programs require the student to attain an overall grade-point average of 3.0 or higher in order to meet graduation requirements. The grade-point average is calculated on the basis of courses and excludes credit for research, which is graded on an S/U basis. Some of the course work can be at the 200-level, dependent upon the program desired by the student and the agreement of his/her advisory committee. Students are generally advised to select a minimum number of 200-level courses for their programs of study and concentrate upon developing proficiency in course material offered at the 300-and 400-levels, which are designated as graduate-level courses by WVU.

Only courses with grades of C or higher may be acceptable for graduate credit, although all course work taken will be counted in establishing the student's average. No more than 9 hours of 200-level credit can be counted toward meeting the course work requirements for the M.S. degree. All doctoral options must include a minimum of 18 semester hours of course work taken at WVU. No more than 20 percent of the course work for a doctoral degree can be at the 200 level. A minimum of 24 semester hours of research credit is required for dissertation requirements. Two semesters of full-time attendance at the WVU Morgantown campus are necessary to meet residency requirements in the Ph.D. program.

The Department of Mechanical and Aerospace Engineering requires six hours of advanced mathematics for M.S. programs of study and a minimum of six additional hours of mathematics for the Ph.D. option. Although these courses need not be taken explicitly from the Department of Mathematics, the general thrust of the courses must be equivalent to the 300-400 level of effort required for the major portion of a plan of study.

Maximum Time for Completion

Master's: All requirements for a master's degree must be completed within eight years preceding the student's graduation. Students should petition for admission to candidacy for the degree during the first semester of residency by filing a plan of study approved by his/her advisory committee. A minimum of 30 hours of course work (including research) is required for the

degree. Students must pass a final examination administered by their advisory committee before being certified for the degree.

Doctorate: The doctorate is a research or performance degree and does not depend on the accumulation of credit hours. The requirements for the degree are admission to candidacy, residency, completion and defense of a research dissertation, and satisfactory compliance with the Interdisciplinary Ph.D. requirements of the College of Engineering. Two members of the Graduate Faculty from outside the department are required to serve on the advisory and examining committee.

The Ph.D. degree signifies that the holder has the competence to function independently at the highest level of endeavor in the chosen field. Hence, the number of years involved in attaining or retaining competency cannot be readily specified nor can an exact program of study be defined. Students seeking admission to the Ph.D. program must show the potential for conducting independent research at the level required to make a contribution to the advancement of knowledge in the field of study. The course work taken should be sufficient to broaden the student's background in at least one other area of the department in addition to the major area of study. A minimum of two minor areas is recommended in addition to the required proficiency in mathematics.

Ph.D. Qualifying/Candidacy Examination—The Ph.D. qualifying/candidacy examination is the method of assessing whether the student has attained sufficient knowledge of the discipline and supporting fields in order to undertake independent research or practice. Students are required to pass a qualifying examination administered by the department which tests for a minimum level of proficiency expected of all students in a given area. It is expected that students will take the qualifying exam during their first semester of enrollment in the Ph.D. program, however it is required that full-time students complete the qualifying examination no later than the end of their second semester past the master's degree. The advisory and examining committee of the student is charged with evaluating the student's competency in the specific area of study through the evaluation of a dissertation proposal for the research to be completed and the evaluation of the student's plan of study and associated course work. After these requirements are completed, the student is formally admitted to candidacy for the Ph.D. degree. Only at this point can a student be called a doctoral candidate; admission to the graduate program for the purpose of pursuing the Ph.D. is not equivalent to becoming a Ph.D. candidate. Doctoral candidates are allowed no more than five years to complete the remaining degree requirements after admission to candidacy. An extension of time can be obtained only by repeating the qualifying examination and meeting any other requirements specified by the student's committee.

Graduate Degree Programs

Master of Science in Aerospace Engineering (M.S.A.E.)

Students wishing to pursue a program leading to an M.S.A.E. degree are required to have a B.S.A.E. or B.S.M.E. from an accredited ABET curriculum, or their equivalent. Students with an engineering background other than aerospace or mechanical engineering normally will be required to strengthen their background. Programs of study must comply with the rules and regulations as outlined in the general requirements for graduate work in the College of Engineering. The student's program of study is formulated jointly

by the student and his/her advisory committee. Normally, a thesis is required of all candidates for the degree of Master of Science in Aerospace Engineering.

Programs of study for the M.S.A.E. degree must include six semester hours of advanced mathematics beyond a first course in differential equations and at least 12 semester hours of aerospace engineering courses taken from any two areas of the department. The remainder of the course work may consist of other courses from Mechanical and Aerospace Engineering, other departments in the College of Engineering, or advanced course work in mathematics, chemistry, and physics. A maximum of six hours of credit is counted toward degree requirements for thesis work. Students not completing a thesis will be required to include three hours of methods courses in their programs of study.

Master of Science in Mechanical Engineering (M.S.M.E.)

Students wishing to pursue a program leading to an M.S.M.E. degree are required to have a B.S.M.E. or B.S.A.E. from an accredited ABET curriculum, or its equivalent. Students with an engineering background other than mechanical or aerospace engineering normally will be required to strengthen their background.

The program of study must include at least six hours of advanced mathematics beyond a first course in differential equations, and 12 total hours of courses from at least two areas of study in mechanical engineering. Students are normally required to write either a thesis or problem report unless they can present compelling evidence of equivalent experience. A maximum of six hours of research credit is counted toward meeting degree requirements for the thesis option; a maximum of three hours of research credit is counted for the problem report option. The student's plan of study is formulated jointly with his/her advisory committee based upon the interests and educational goals of the student. Students not completing a thesis or problem report will be required to include three hours of methods courses in their programs of study. Programs of study must comply with the rules and regulations as outlined in the general requirements for graduate work in the College of Engineering.

Master of Science in Engineering (M.S.E.)

The M.S.E. program administered by the College of Engineering is generally intended for students who desire to do graduate work in areas other than their baccalaureate major. Students desiring to pursue such a program in the department must meet similar general requirements as for the M.S.A.E. and M.S.M.E. degree programs, although their overall program may be more flexible.

Each plan of study in the M.S.E. program must include six hours of advanced mathematics and nine hours from any two academic areas in the department. The plan of study may follow thesis or problem report programs applicable to the designated master's programs. Students not completing a thesis or problem report will be required to include three hours of methods courses in their programs of study. Programs of study must comply with the rules and regulations as outlined in the general requirements for graduate work in the College of Engineering.

Doctor of Philosophy (Ph.D.)

Students intending to pursue a doctoral program in the College of Engineering with an emphasis in mechanical or aerospace engineering should

have earned a B.S. or an M.S. degree in some discipline of engineering. While it is possible for a student with a B.S. degree to enroll directly in the Ph.D. program, it is advisable to earn a master's degree first.

As with the department's master's programs, the doctoral courses of study are selected to fit the individual interests and objectives of the student, with proper attention given to broadening related areas of study.

The research work for the doctoral dissertation may entail a fundamental investigation into a specialized area or a broad and comprehensive program of study. Programs of study must comply with the rules and regulations as outlined in the general requirements for graduate work in the College of Engineering.

Academic Areas in Mechanical and Aerospace Engineering

Courses in the department are organized under the four academic areas: aerodynamics and fluids engineering; solid mechanics, materials and structures; system control and design; and thermal sciences and engineering. In addition, students may pursue studies leading to a specialization in bioengineering.

Aerodynamics and Fluids Engineering

Students may pursue an advanced degree with specialization in aerodynamics and fluids engineering in either the aerospace engineering or the mechanical engineering program. A variety of courses and facilities support graduate research in these areas. Laboratories are located in the Engineering Sciences Building, with separate wind tunnel and wind turbine facilities in adjoining buildings and remote sites. Flow facilities include instrumented subsonic and supersonic wind tunnels, shock tubes, and several flow loops mainly used for research in gas-solid and density stratified flows. Available instrumentation includes eight channels of hot wire/film anemometry, two single-component and one three-component laser doppler velocimeter (LDV) systems. A hydraulic facility is also available for flow metering studies and includes a calibration system and pressure transmitters. The department owns well-instrumented V/STOL and Cessna U-206 flight test aircraft housed in hangar facilities at Hart Field. A complete library of full-length films and film loops developed by the National Committee for Fluid Mechanics Films is available for student use. A significant portion of the current activity involves numerical solutions to flow problems and is supported by a computing facility dedicated to graduate research.

Although the faculty background and interests are broad, recent research has been concentrated on problems in multiphase and density-stratified flows, low-speed aerodynamics, shock phenomena in two-phase systems, boundary layer control and high-speed aerodynamics. These research areas include topics such as fluidized bed combustion, aerosol sampling, flow metering, flow distribution systems, numerical solutions to gas-solid flows, and fluid-particle turbulence interactions, including deposition on solid surfaces. The low-speed aerodynamics work is related to the design of vertical axis wind turbines and STOL airfoils. The research in high-speed aerodynamics deals with viscous-inviscid interactions in transonic, supersonic, and hypersonic flow.

The faculty has a wide range of experience and expertise in aerodynamics and fluids engineering. Their professional service activities include flight instruction and ham radio operation, service on local A.I.A.A. and A.S.M.E.

section programs, and service at the national level in organizing and chairing technical meetings and symposia.

Solid Mechanics, Materials and Structures

Students wishing to pursue graduate studies in the academic area of solid mechanics, materials, and structures (SMMS) may do so within the department under the M.S.E., M.S.A.E., M.S.M.E., or the Ph.D. program. This area encompasses the theoretical, numerical, and experimental study of solid bodies, from concentration on local behavior of deformable bodies to the global response of structural elements or the motion of rigid bodies. Hence, SMMS students may explore the mechanical behavior of materials in the neighborhood of micro-scale defects such as cracks or investigate the behavior of large-scale bodies such as aerospace structures.

The SMMS faculty carries out basic and applied research related to problems in engineering using state-of-the-art computational and experimental techniques. The areas of research include aeroelasticity, fracture mechanics, nonlinear dynamics and vibrations, composite materials, biomechanics, computational methods such as finite-element and boundary-element, and experimental techniques including optical methods. Furthermore, in cooperation with the Department of Civil Engineering, SMMS students may pursue studies related to civil engineering. Access to a large array of research facilities enables students and faculty to pursue their interests. These facilities include laboratories (materials, structures, vibrations, photomechanics, biomechanics, fracture mechanics, and computer aided engineering), computers (IBM and VAX mainframes, work stations, personal computers, supercomputers), and shop facilities.

Regardless of the chosen specialty, the SMMS student is required to take six hours of courses from a core group consisting of M.A.E. 311, M.A. E. 320, and C.E. 462. This requirement may be waived for students who can demonstrate, based on their transcripts, that they possess equivalent knowledge. These courses, combined with the entire plan of study which includes research credits, prepares the SMMS student to apply mechanics to modern engineering challenges.

System Control and Design

The system control and design academic area offers instructional and research opportunities for qualified students who are personally challenged to attain the expertise required to design or control the behavior of a system in a dynamic environment. Instructional offerings furnish students with a foundation for developing prototype systems and for improving the performance of existing systems. These offerings provide such emphasis as elastodynamic analysis, computerized design, and active control in automated machines.

The research endeavors of its faculty reflect a close association with current industrial-type situations. These endeavors have achieved improvements for such applications as lung system modeling, acid control in streams or rivers, railroad yard retarder design, noise control in industrial nozzles, coal feeder system design, engine acoustic impedance modeling, and the control of energy systems in buildings.

The system control and design faculty has active relations with other engineering colleagues, having interests in process control, microprocessor applications, and computer-aided manufacturing. The expertise of the faculty

includes the successful completion of programs for governmental agencies (NASA, U.S. Forest Service, West Virginia Department of Natural Resources, Department of Energy, Department of Health and Human Services), and industrial firms. One of the faculty is a member of the Examining Board for Professional Engineers in West Virginia.

Recent activity in the department has centered on programs in robotics and artificial intelligence. A Rhino robot system has been acquired for teaching and research. A computer aided design (CAD) laboratory has been developed along with appropriate course work and research activity.

Thermal Sciences and Engineering

The thermal sciences and engineering academic area encompasses the fields of thermodynamics, combustion, heat transfer, and power and energy systems. The faculty has a substantial amount of service in industries involving fossil and nuclear power generation, propulsion, and combustion problems. Graduate course offerings cover a wide range of topics in this area with applications both to aerospace and mechanical engineering problems. Recent research efforts include topics such as the analysis of fluidized bed combustion, energy analysis of buildings, oscillating jet combustion, alternative fuels testing, internal combustion engine performance and emissions, heat transfer, numerical analysis of thermal systems, deposition on turbine blades, and reactor design.

Research facilities include a high-altitude simulation chamber for ablation and wear studies; a fluidized bed combustion experimental system; a thermal analyzer; an electrically-heated, natural convection water facility; schlieren systems for flows with varying density; a 48-channel recording thermocouple data-acquisition system; a water reservoir for thermal stratification studies; and high-temperature thermocouple calibration equipment.

Bioengineering Program

The M. A. E. department, in conjunction with other departments in both the College of Engineering and the Health Sciences Center, offers a program in bioengineering culminating in Master's (M.S.E., M.S. M.E., or M.S.A.E.) and Ph.D. degrees. The plan of study for a master's degree requires a minimum of 30 credit hours. This includes at least six hours of bioengineering or medical courses. Students are encouraged to continue toward a Ph.D. by following a plan of study tailored specifically to their research interests. Students whose B.S. degrees are in disciplines other than engineering may be required to complete prerequisite courses.

Areas of research specialization include respiratory and diseased tissue mechanics, orthopedic mechanics, bone growth and fracture, and the application of computer-aided design and microprocessor-based instrumentation to rehabilitation. Research facilities include an aerosol inhalation exposure system, laser-based holographic and moire interferometric equipment, a lung acoustic impedance measurement system, and modern orthopedic, rehabilitation, and computer research laboratories.

Mechanical and Aerospace Engineering (M.A.E.)

200. *Advanced Mechanics of Materials 1.* 3 hr. PR: M.A.E. 43 or consent. Advanced topics in applied stress analysis: stress concentrations, strain energy, beams, thick-walled cylinders, torsional warping, fracture. 3 hr. lec.

210. **Kinematics.** 3 hr. PR: M.A.E. 130 and Math. 18 or consent. Geometry of constrained motion, kinematics synthesis and design, special linkage. Coupler curves, inflection circle, Euler-Savary equation, cubic of stationary curvature and finite displacement techniques. 3 hr. lec.

215. **Experimental Fluid Dynamics** 2.3 hr. PR: M.A.E. 115. Continuation of M.A.E. 115 with increased emphasis on dynamic measurements. Shock tube/tunnel and subsonic and supersonic measurements. Experiments include optical techniques, heat transfer to models, and viscous flow measurements. Error analysis of test data. 2 hr. lec., 3 hr. lab.

216. **Applied Aerodynamics.** 3 hr. PR: M.A.E. 116. Chordwise and spanwise airload distribution for plain wings, wings with aerodynamic and geometric twist, wings with deflected flaps, and wings with ailerons deflected. Section induced drag characteristics. 3 hr. lec.

220. **Guided Missile Systems.** 3 hr. PR: M.A.E. 117 and/or Conc.: M.A.E. 150. Design philosophy according to mission requirements. Preliminary configuration and design concepts. Aerodynamic effects on missiles during launch and flight. Ballistic missile trajectories. Stability determination by analog simulation. Performance determination by digital and analog simulation. Control, guidance, and propulsion systems. Operational and reliability considerations. 3 hr. lec.

226. **Mechanics of Composite Materials.** 3 hr. PR: Math. 17, M.A.E. 43. Fundamental methods for structural analysis of fiber reinforced composites-lamination theory and micromechanics. Particularities of composite applications in design and manufacturing of structural components-performance tailoring, failure criteria, environmental effects, joining and processing.

236. **Systems Analysis of Space Satellites.** 3 hr. PR: Senior standing. Introduction to engineering principles associated with analysis and design of space satellites. Emphasis on the interdisciplinary nature of satellite systems analysis. 3 hr. lec.

240. **Problems in Thermodynamics.** 3 hr. PR: M.A.E. 141 or consent. Thermodynamic systems with special emphasis on actual processes. Problems presented are designed to strengthen the background of the student in the application of the fundamental thermodynamic concepts. 3 hr. lec.

241. **Flight Mechanics 2.** 3 hr. PR: M.A.E. 146. Fundamental concepts of feedback control system analysis and design. Automatic flight controls, and human pilot plus airframe considered as a closed loop system. Stability augmentation. 3 hr. lec.

242. **Flight Testing.** 3 hr. PR: M.A.E. 146. Applied flight test techniques and instrumentation, calibration methods, determination of static performance characteristics, and introduction to stability and control testing based on flight test of Cessna Super Skywagon airplane. Flight test data analysis and report preparation. 1 hr. lec., 6 hr. lab.

243. **Bioengineering.** 3 hr. PR M.A.E. 43, Phys. 201 or consent. Introduction to human anatomy and physiology using an engineering systems approach. Gives the engineering student a basic understanding of the human system so that the student may include it as an integral part of the design. 3 hr. lec.

244. **Introduction to Gas Dynamics.** 3 hr. PR: M.A.E. 144 or consent. Fundamentals of gas dynamics, one-dimensional gas dynamics and wave motion, measurement, effect of viscosity and conductivity, and concepts from gas kinetics. 3 hr. lec.

249. **Space Mechanics.** 3 hr. PR: Math. 18, M.A.E. 42. Flight in and beyond the earth's atmosphere by space vehicles. Laws of Kepler and Orbital theory. Energy requirements for satellite and interplanetary travel. Exit from and entry into an atmosphere. 3 hr. lec.

254. *Applications in Heat Transfer.* 3 hr. PR: M.A.E. 158. Application of basic heat transfer theory and digital computation techniques to problems involving heat exchangers, power plants, electronic cooling, manufacturing processes, and environmental problems. 3 hr. lec.

262. *Internal Combustion Engines.* 3 hr. PR: M.A.E. 101 or 141. Thermodynamics of the internal combustion engine; Otto cycle; Diesel cycle, gas turbine cycle, two- and four-cycle engines, fuels, carburetion and fuel injection; combustion; engine performance, supercharging. 3 hr. lec.

264. *Heating, Ventilating, and Air Conditioning.* 3 hr. PR: M.A.E. 141 or consent. Methods and systems of heating, ventilating, and air conditioning of various types of buildings; types of controls and their application. 3 hr. lec.

265. *Aeroelasticity.* 3 hr. PR: M.A.E. 160. Vibrating systems of single degree and multiple degrees of freedom, flutter theory and modes of vibration, torsional divergence, and control reversal. 3 hr. lec.

270. *Microprocessor Applications in Mechanical Engineering.* 3 hr. PR: M.A.E. 181. Fundamentals of programming and interfacing a microprocessor. Hands-on, hardware oriented. Assembly language and BASIC programming. RAM, EPROM, analog to digital and digital to analog converters, stepper motors, encoders, AC devices. Interfacing project required. 3 hr. lec.

275. *Computer-Aided Design: Applications. II.* 3 hr. PR: M.A.E. 132 or 161; Coreq.: M.A.E. 250. CAD fundamentals. User-computer interface and interactive programming for rational design. Computational tools, finite elements and modeling techniques. Interactive graphics, pre-post processor applications. Case studies: conceptual-preliminary-detail iterative design and analysis.

280. *Aerospace Problems.* 1-6 hr. PR: Upper-division and graduate standing.

282. *Engineering Acoustics.* 3 hr. PR: Math. 18 or consent. Theory of sound propagation and transmission. Important industrial noise sources and sound measurement equipment. Noise criteria and control methods. Assessment of noise abatement technology. Laboratory studies and case histories.

284. *Applied Feedback Control.* 3 hr. PR: M.A.E. 122 or consent. Application of automatic control theory. Transfer functions and block diagrams for linear physical systems. Proportional, integral, and derivative controllers. Transient and frequency response using Laplace transformation. 3 hr. lec.

285. *Thesis.* 2-6 hr. PR: Senior standing and consent.

286. *Design of Robotic Systems.* 3 hr. PR: M.A.E. 113 or consent. Mechanical automation design associated with robotic systems, including economic justification and ethics. Geometric choices and controller specifications for programmable manipulators. Workstation strategies such as CNC and CIM for computer-based flexible manufacturing.

290. *Seminar.* 1-6 hr. PR: Junior, senior, or graduate standing, and consent.

291. *Introduction to Research.* 1-3 hr. PR: Senior standing and consent. Methods of organizing theoretical and experimental research. Formulation of problems, project planning, and research proposal preparation.

292. *Research Problems.* 2-6 hr. PR: M.A.E. 291 or consent. Performance of the research project as proposed in M.A.E. 291. Project results are given in written technical reports with conclusions and recommendations.

294. *Special Topics.* 1-6 hr. PR: Junior, senior, or graduate standing, and consent.

299. *Special Problems.* 1-6 hr. PR: Consent.

300. Seminar. Credit. Attendance required of all aerospace graduate students at scheduled seminars.

301. *Advanced Engineering Acoustics*. 3 hr. PR: M.A.E. 282 or consent. Study of complex sound generation and the propagation, transmission, reflection, and absorption of airborne and structure-borne sound. Coupling of sound and vibration in structures. Acoustical behavior and characteristics of materials, aeroacoustics, and acoustics of combustion systems.

305. *Analytical Methods in Engineering 1*. 3 hr. PR: Consent. Index notation for determinants, matrices, and quadratic forms; linear vector spaces, linear operators including differential operators; calculus of variations, eigenvalue problems, and boundary value problems.

306. *Analytical Methods in Engineering 2*. 3 hr. PR: M.A.E. 305 or at least two semesters of advanced calculus. Intended for advanced graduate students interested in modern analysis for engineering applications.

307. *Nonlinear Analysis in Engineering*. 3 hr. PR: Consent. Special topics in nonlinear analysis of various types of engineering systems. Various numerical, approximate, and analytical techniques chosen to suit the needs and interests of advanced graduate students.

310. *Advanced Mechanics of Materials 2*. 3 hr. PR: M.A.E. 320 or consent. Mechanics of composite materials: anisotropic stress-strain relations and property characterization, lamina behavior, general laminate analysis, environmental effects. 3 hr. lec.

311. *Advanced Mechanics of Materials*. 3 hr. PR: Consent. Shear flow and shear center; curved beams; unsymmetric bending, energy methods in structural analysis; theories of failure; instability of structures; beams on elastic foundation.

312. *Inelastic Behavior of Engineering Materials*. 3 hr. PR: M.A.E. 41, 42, 43, and consent. Characterization and modeling of typical engineering materials, elastic, viscoelastic, and plastic materials, design considerations.

315. *Fluid Flow Measurements*. 3 hr. PR: M.A.E. 117 or consent. Principles and measurements of static and dynamic pressures and temperatures, velocity, and Mach number and forces. Optical techniques and photography. Design of experiments. Review of selected papers from the literature. 2 hr. lec., 3 hr. lab.

316. *Energy Methods in Applied Mechanics*. 3 hr. PR: Consent. Variational principles of mechanics and applications to engineering problems; principles of virtual displacements, minimum potential energy, and complementary energy. Castigliano's theorem. Hamilton's principle. Applications to theory of plates, shells, and stability. 3 hr. lec.

318. *Continuum Mechanics*. 3 hr. PR: M.A.E. 41, 42, 43. Basic laws of physical behavior of continuous media. Analysis of stress; equations of motion and boundary conditions; kinematic analysis; rates of strain, dilation and rotation; bulk time, rates of change; constitutive equations with special attention to elastic bodies and ideal fluids; energy equations and the first law of thermodynamics. 3 hr. lec.

320. *Theory of Elasticity 1*. 3 hr. Cartesian tensors; equations of classical elasticity, energy, minimum, and uniqueness theorems for the first and second boundary value problems; St. Venant principle; extension, torsion, and bending problems. 3 hr. lec.

322. *Advanced Vibrations 1*. 3 hr. PR: M.A.E. 122 or consent. Dynamic analysis of multiple degree of freedom discrete vibrating systems. Lagrangian formulation, matrix and numerical methods, impact and mechanical transients. 3 hr. lab.

325. *Experimental Stress Analysis*. 3 hr. PR: M.A.E. 43. Classical photoelasticity, brittle lacquers, birefringent coatings, strain gage techniques and instrumentation, as applied to problems involving static stress distributions. 2 hr. lec., 3 hr. lab.

330. *Instrumentation in Engineering 1.* 3 hr. PR: Consent. Theory of measuring systems, emphasizing measurement of rapidly changing force, pressure, strain, temperature, vibration, etc. Available instruments, methods of noise elimination, types of recording studied. Of special value to students in experimental research. 2 hr. lec., 3 hr. lab.

333. *Advanced Machine Design.* 3 hr. PR: M.A.E. 135 or consent. Design for extreme environments, material selection, lubrication and wear, dynamic loads on cams, gears, and bearings, balancing of multiengines and rotors, electromechanical components.

335. *Advanced Kinematics of Mechanisms.* 3 hr. PR: MAE 210 or consent. Analytical synthesis of mechanisms with up to five accuracy points; Burmester curve theory and path curvature theory; force and moment balancing of mechanisms; computer-aided dynamic analysis of mechanisms and inverse dynamic analysis.

340. *Advanced Thermodynamics 1.* 3 hr. PR: M.A.E. 141 or consent. First and second laws of thermodynamics with emphasis on the concept of entropy production. Application to a variety of nonsteady open systems, thermodynamics of multi-phase, multicomponent and reacting systems. Criteria for equilibrium and stability.

342. *Advanced Thermodynamics 2.* 3 hr. PR: M.A.E. 340 or consent. Continuation of topics related to reactive systems. Adiabatic flame temperatures, reaction kinetics, conservation of species equations, flame propagation and detonation.

344. *Statistical Thermodynamics.* 3 hr. PR: M.A.E. 340 or consent. Microscopic thermodynamics for Boltzmann, Bose-Einstein, and Fermi-Dirac statistics. Schrodinger wave equation, partition functions for gases and solids.

348. *Heat Transfer.* 3 hr. PR: Undergraduate course in heat transfer or consent. (Primarily for mechanical and aerospace engineering students.) Topics include one-, two-, and three-dimensional thermal conduction involved in mechanical processes both for constant and time varying temperature fields, free and forced convection in heat exchangers, heat power equipment and aircraft and radiative heat transfer between surfaces and absorbing media as found in furnaces, industrial processes, and aerospace applications.

350. *Conduction Heat Transfer.* 3 hr. PR: M.A.E. 158 or consent. Analytical, numerical, graphical, and analog solutions of steady and non-steady heat conduction problems in isotropic solids. Thermal properties, extended surfaces, thermal stress, interphase conduction with moving interface, socalized and distributed sources.

352. *Intermediate Dynamics.* 3 hr. PR: M.A.E. 42. Newtonian and Lagrangian mechanics. Dynamics of discrete systems and rigid bodies analyzed utilizing Newtonian and Lagrangian formulations.

353. *Advanced Dynamics 1.* 3 hr. PR: M.A.E. 352 or consent. Analytical mechanics. Stability of autonomous and nonautonomous systems considered and analytical solutions by perturbation techniques introduced. Hamilton-Jacobi equations developed. Problems involving spacecraft, gyroscopes, and celestial mechanics studied.

354. *Convection Heat Transfer.* 3 hr. PR: M.A.E. 158 or consent. Laminar and turbulent flows. Analytical, numerical, and analogical solution. Selected study of current research.

355. *Radiation Heat Transfer.* 3 hr. PR: M.A.E. 158 or consent. Classical derivation of black body radiation laws; gray body and non-gray analysis; radiant properties of materials, radiant transport analysis, specular-diffuse networks, gas radiation, thermal radiation measurements; analytical, numerical solutions, and study of selected publications. 3 hr. lec.

360. *Fluid Mechanics 1.* 3 hr. PR: M.A.E. 144 or equiv. Advanced dynamics and thermodynamics of fluids. Basic laws of conservation of mass and momentum in differential, vector, and integral forms. Application to internal flows, fluid machinery, and structures.

364. *Turbomachinery.* 3 hr. PR: M.A.E. 140 or consent. Flow problems encountered in design of water, gas, and steam turbines, centrifugal and axial flow pumps and compressors, design parameters.

380. *Special Problems.* 2-4 hr. Consent of department chairperson. For graduate students in the non-research program. The student will select a specialized field and follow a course of study in that field under the supervision of a counselor.

384. *Feedback Control in Mechanical Engineering.* 3 hr. PR: M.A.E. 284 or consent. Control analysis of hydraulic and pneumatic closed-loop systems including spool valves, flapper valves, pumps, servomotors, and electrohydraulic servomechanisms. Investigation of nonlinearities by phase plane, Liapunov, and describing function techniques. Programming for analog and digital computer simulation. Introduction to fluidic elements and logic circuits.

386. *Robot Mechanics and Control.* 3 hr. Kinematic and dynamic behavior of industrial robot manipulators; formulation of equations of motion for link joint space and endeffector cartesian space; path planning and trajectory motion control schemes.

394. *Special Topics.* 1-6 hr. PR: Senior or graduate standing.

399. *Special Problems.* 1-6 hr. PR: Senior or graduate standing.

411. *Dynamics of Viscous Fluids.* 3 hr. PR: Consent. Exact solutions of the Navier-Stokes equations. Laminar incompressible and compressible boundary layer theory, similarity solutions, and integral methods. 3 hr. lec.

412. *Fundamentals of Turbulent Flow.* 3 hr. PR: M.A.E. 411 or consent. Basic experimental data. Application of semi-empirical theories to pipe, jet and boundary layer flow. Turbulent heat and mass transfer. Statistical theory of turbulence and recent applications. 3 hr. lec.

413. *Dynamics of Real Gases.* 3 hr. PR: M.A.E. 411 or consent. Fundamentals of multicomponent, chemically reacting, gas flows; thermodynamic properties of equilibrium mixtures from statistical mechanics; chemical kinetics; effects of the chemical model on high-temperature, high-speed flow properties.

414. *Theory of Elastic Stability.* 3 hr. PR: Consent. Stability of discrete mechanical systems, energy theorems, buckling of beams, beam columns, and frames, torsional buckling, buckling of plates and shells, special topics.

419. *Topics in Fluids and Solids.* 3 hr. PR: Consent. Finite elasticity and viscoelasticity, non-Newtonian fluids, nonlinear constitutive theories, special topics in solids and fluids.

421. *Theory of Elasticity 2.* 3 hr. PR: M.A.E. 320 (or M.A.E. 310 and consent). Complex variable methods, stress couples, nonlinear elasticity, numerical methods, potential methods, boundary value problems, various special topics. 3 hr. lec.

422. *Advanced Vibrations 2.* 3 hr. PR: M.A.E. 222, M.A.E. 322 or consent. Dynamic analysis of continuous media. Vibration and wave motion analysis of strings, elastic bars, beams, plates and fluid columns. Earthquake wave propagation.

424. *Theory of Plates and Shells.* 3 hr. PR: M.A.E. 310. Cylindrical bending, theory of rectangular and circular plates, membrane shells of revolution, shells with bending stiffness, dynamic response of plates and shells, numerical applications.

425. *Perfect Fluid Theory.* 3 hr. PR: Consent. Conformal mapping including Schwarz-Christoffel and Joukowski transformations. Inviscid flows over airfoils, spheres, cones, wedges, and bodies of revolution. 3 hr. lec.

428. Photomechanics. 3 hr. PR: M.A.E. 200, 325. Theory of optics, birefringence, stress-optic law, polariscope, compensation. Techniques of model making, photography, polariscope use. Photoelastic coating methods and use of various reflective polariscopes. Data interpretation by various methods including principal stress separation by shear difference, oblique incidence and graphical integration. 2 hr. rec., 3 hr. lab.

431. Instrumentation in Engineering 2. 3 hr. PR: M.A.E. 330. Continuation of M.A.E. 330 with emphasis on transducers for static and dynamic measurement and their use in practical measuring systems. 3 hr. rec.

435. Gas Dynamics 1. 3 hr. PR: M.A.E. 112 or consent. Nonsteady gas dynamics and shock tube theory. Shock tubes in aerospace research. Compressible flow theory in subsonic, transonic, and supersonic regimes. 3 hr. lec.

440. Irreversible Thermodynamics 1. 3 hr. PR: M.A.E. 340 or consent. Phenomenological treatment of the laws of dynamics and thermodynamics for irreversible processes in continuous media. Linear laws for combined irreversible phenomena including viscous dissipation, heat conduction, diffusion, chemical reactions and electric and magnetic effects, are developed taking into account Curie's principle and the Onsager relations. The principle of the minimum rate of creation of entropy is extended to establish criteria for the stability of stationary states. Tensor and variational methods are employed.

441. Irreversible Thermodynamics 2. 3 hr. PR: M.A.E. 440. Continuation of M.A.E. 440 with emphasis on selected topics from such applications as thermoelectricity, anisotropic heat conduction, stability of fluid motion, thermal diffusion and separation, viscochemical drag, electrochemical cells, and other coupled phenomena of physical or biological interests.

442. Advanced Flight Mechanics. 3 hr. PR: M.A.E. 112, 142. Dynamic stability. Obtaining flight characteristics of the vehicle from dynamic flight test techniques such as frequency response, and transient response methods. Problems of automatic control. 3 hr. lec.

445. Hydrodynamic Stability Theory. 3 hr. PR: MAE 411 or MAE 425 or consent. Response of flowfield to disturbances; classical instability mechanisms; inviscid centrifugal instabilities; inviscid parallel shear flow stability; viscous boundary layer stability, the Orr-Sommerfield equation; Rayleigh-Benard flow; introduction to nonlinear stability theory.

450. Fundamentals of Combustion. 3 hr. PR: M.A.E. 112 or consent. Kinetic theory, transport phenomena, chemical equilibrium and reaction kinetics. Flames, their gross properties, structure and gas dynamics. Solid and liquid propellant combustion. 3 hr. lec.

454. Advanced Dynamics 2. 3 hr. PR: Consent. Advanced study in dynamics. Topics covered are either nonlinear vibration, advanced control theory, or stability theory depending on student demand.

461. Fluid Mechanics 2. 3 hr. PR: M.A.E. 360 or equiv. Statistical nature of turbulence, correlation functions, and Fourier representations. Kinematics of isotropic and nonisotropic turbulent flows. Experimental methods. Application to dynamic loading on structures, diffusion and dispersion of contaminants by turbulent fields and heat and mass transfer.

491. Advanced Study. 1-6 hr. PR: Consent. Advanced study in areas not covered by formal courses.

492. Seminar: Engineering Education. 1-6 hr. PR: Consent. Studies and group discussion of selected problems in engineering education. Emphasis on application of educational principles to specific areas in engineering education.

- 493. Seminar: Bioengineering. 1-6 hr. PR: Consent. An exposition of contemporary topics in bioengineering. Topics include advancements in biomedical instrumentation, prosthetics, cardiovascular research, biological controls, biomechanics, neurophysiological research, human factors and anthropometrics.
- 494. Seminar. 1-6 hr. PR: Consent. Discussion, library readings, and individual study reports in the mechanical and aerospace engineering fields.
- 497. Research. 1-15 hr. PR: Graduate standing. Ph.D. dissertation research.
- 499. Graduate Colloquium. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use University facilities, and participate in its academic and cultural programs.

MEDICAL TECHNOLOGY

Jean D. Holter, Director of the Program

2138 Health Sciences North

Degree Offered: Master of Science

Graduate Faculty: Members Holter, Iammarino, S. Jagannathan, Mengoli, and Rodman.

The WVU Medical Technology graduate program prepares graduate medical technologists for positions either as administrators and teachers in medical technology educational programs or as supervisors in special areas of the clinical laboratory. The primary objective is to assist in development of knowledge in an area in administration, in education, or a special area of interest selected by the student which may be a special medical laboratory science as the specific area applies to laboratory medicine. Specializations include clinical chemistry, clinical microbiology, hematology, and immunohematology. The specific course work requirements for the master of science degree rests with the graduate adviser in the student's specific area of interest.

Graduate Committee: J. Holter, R. Iammarino, S. Jagannathan, H. Mengoli, and N. Rodman.

Admission

Applicants must have a baccalaureate degree in medical technology from an accredited institution or a baccalaureate degree in an allied field and be a certified medical technologist with an acceptable certifying agency.

Information concerning the medical technology undergraduate program may be found in the *WVU Health Sciences (Medical Center) Catalog*.

The area of concentration in medical technology desired by the student is considered in the evaluation of the undergraduate as follows:

1. Individuals who desire to do special study in clinical chemistry, hematology, or immunohematology must have completed eight hours of physics, three hours of mathematics, four hours of organic chemistry, and four hours of analytical chemistry on the college level.

2. Individuals who desire to do special study in microbiology must have completed four hours of organic chemistry and 16 hours of biological sciences.

3. A minimum of one year's experience in a clinical laboratory is required for admission.

Students will be required to make up deficiencies in the above, as well as other deficiencies deemed necessary by the adviser.

Applicants must have a minimum undergraduate grade-point average of 2.5 (based on A=4.0 grade points) for admission.

All applicants are required to take the general aptitude part of the Graduate Record Examination. Results should be sent to the WVU Medical Technology Programs Office, Morgantown, WV 26506.

Two letters of reference must be on file in the Medical Technology Office. One letter should be from the major adviser in the undergraduate college and another from the immediate supervisor of the applicant's present position. An interview will be requested for all applicants who meet the requirements for admission.

Applicants are selected for admission on the basis of scholastic standing, recommendations, and interest in the field of medical technology. The number of applicants accepted is necessarily limited by the available facilities; and in general, applicants with the most experience are considered first.

Application Procedure

A preliminary application is filed in the Medical Technology Programs Office.

Letters of recommendation are sent to the Medical Technology Programs Office.

After approval of the preliminary application, the admission procedure is the same as for other WVU graduate programs.

A personal interview is required before final admission to the program. This interview will give the graduate student an opportunity to evaluate the program and to determine if the program will offer the educational opportunities which the student desires.

Course of Study

It is expected that students entering the graduate program in medical technology will have a goal in mind and a special field of interest. A minimum of 36 semester hours of credit, including a research problem, is required. The student selects a major area of concentration from either education, supervision, or administration, and a minor area from clinical microbiology, clinical chemistry, clinical hematology, or immunohematology. A minimum of 15 semester hours of course work from the following courses is required dependent upon concentration:

Required:

Ed. P. 320—Introduction to Research

Education:

Hl. Ed. 320—Roles and Functions of Health Education

Ed. A. 320—Personnel Administration

Ed. A. 351—Administrative Procedures in Adult Education

Ed. A. 462—Higher Education Law

Ed. A. 463—Higher Education Finance

Ed. F. 320—Philosophic Systems and Education

Supervision/Administration:

Ed. A. 320—Personnel Administration

Ed. A. 462—Higher Education Law

Ed. A. 463—Higher Education Finance

Pub. A. 341—Administrative Organization and Management

Pub. A. 344—Public Personnel Administration

Pub. A. 345—Public Administration and Policy Development

Either Major:

Ed. P. 231—Sampling Methods

Ed. P. 321—Design of Experiments

Ed. P. 343—Statistical Analysis in Education

Ed. P. 260—Medical and Microcomputers in Instruction
Ed. P. 301—Introductory Behavior Analysis: Human Resources
Ed. P. 364—Precision Teaching
Ed. P. 370—Programmatic Research
Hl. Ed. 308—Community Health: Death Education
Hl. Ed. 309—Community Health: Drug Education

Recommended:

Ed. P. 311—Statistical Methods
Stat. 311—Statistical Methods
C. Med. 311—Biostatistics

Other courses to complete 36 semester hours are selected by the student and the adviser in the area of concentration selected by the student. Students may select courses in departments in schools other than the School of Medicine.

All students must complete a minimum of 18 semester hours in a science related to medical technology including seminar (three hours) and problem study (six hours).

In addition, at the discretion of the student's adviser, other requirements in teaching, supervision, and administration may be necessary.

The adviser formulates with the student a plan of study for the entire program. This plan is usually made at the end of the first semester of graduate study. A copy of this "plan of study" is signed by the adviser and student and sent to the Medical Technology Office to be put in the student's file.

Examinations

A final written comprehensive examination in the major and minor interest areas is given approximately one month before the oral defense.

An oral defense of the problem is given about one month after submission of the Problem Study in its final form to the student's Graduate Committee.

Requirements for Degree

All requirements for the master of science degree, as outlined in this catalog, must be fulfilled. These requirements can be fulfilled in three semesters of full-time work, but ordinarily at least four semesters are required for completion of the degree requirements.

Degree candidates must have a 3.0 grade-point average and must have removed all incomplete grades and deficiencies.

All students must complete a problem study (see M. Tec. 497).

Medical Technology (M. Tec.)

300. **Seminar.** I, II, S. 1 hr. Seminars include topics in laboratory management and education in medical technology, and timely topics. Minimum of 3 semester hours to include all three topics is required of all graduate students in the medical technology program.
491. **Advanced Study.** I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.
497. **Research.** I, II, S. 1-15 hr. Student is required to pursue study on a problem in the student's area of concentration. This study is reported in a thesis-style manuscript. For this study and report, the student registers in M. Tec. 497. Total number of hours earned in M. Tec. 497 is determined by the student's adviser. As many as 9 semester hours may be taken during one semester or, by arrangement with the adviser, credit hours may be taken over several semesters. In the final compilation for degree requirements, only 6 semester hours in M. Tec. 497 will be counted toward fulfillment of the 36 required semester hours for the degree even though the student may have registered for as many as 15 hours in M. Tec. 497.

MICROBIOLOGY and IMMUNOLOGY

Irvin S. Snyder, Chairperson of the Department

2095-B Health Sciences North

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Burrell, Charon, Gerencser, Landreth, Lewis, Olenchock, Pore, Sheil, Snyder, Sorenson, Thompson, Yelton, and Young. Associate Members Hall and Mengoli.

The Department of Microbiology and Immunology offers programs of study leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in microbiology and immunology. Students with an undergraduate degree can apply to either the M.S. or Ph.D. program. The major purpose of graduate education in microbiology and immunology is research training. The basic philosophy of the department is that the students have a strong foundation in basic concepts of microbiology and immunology, and flexibility in choosing advanced course work in their specific areas of interest. A major emphasis of the graduate program is extensive laboratory research training in microbiology and immunology. Each student will complete an original, in-depth research investigation. The overall aim of the program is to produce students capable of designing and completing independent research and teaching.

Admission Requirements

Applicants to either the Ph.D. or M.S. graduate programs in microbiology and immunology must have at least four upper level courses in the biological sciences, two semesters of organic chemistry, two semesters of physics, and a strong background in mathematics—including calculus—in order to be considered for admission. Applicants must submit a departmental application form, three letters of recommendation, and Graduate Record Examination (GRE) scores—both aptitude and advanced—to the Chairperson, Admissions and Scholarship Committee, Department of Microbiology and Immunology. In addition, transcripts and an official application for admission must be sent directly to the WVU Office of Admissions and Records, P.O. Box 6009, Morgantown, WV 26506-6009. Applicants for admission to a degree program should have a grade-point average of 3.0 or better, and a score of 600 or above on each of the GRE examinations. International students must have a TOEFL score of 550. Early application is encouraged. Applicants desiring financial aid should complete their application before January 1. All applications must be completed by June for fall admission. Applications for admission in the spring semester must be completed by November 1.

Program Requirements

Master of Science

Every student must take the following courses or demonstrate proficiency by examination in each of the following areas: Microbiology (M.Bio) 301 *Medical Microbiology and Immunology*, M.Bio 310 *Structure and Activities of Microorganisms*, M.Bio 491 (a three hour course in immunology) and M.Bio 391 *Advanced Topics* (laboratory rotation). Two semesters of biochemistry are required. The remainder of the course work is selected by the student and the advisory committee from the following courses: M.Bio 327 and any of the topics covered in M.Bio 491 *Microbiology and Immunology Advanced Study*. Enrollment in M.Bio 496 *Seminar* is required each semester that the student is in residence. All full-time students in the Department of Microbiology and

Immunology are required to participate in teaching at least one semester a year.

The Master of Science program requires 30 hours of course work, of which at least 20 hours must be in microbiology and immunology. Six hours must be in research (M. Bio. 397 Master's Degree Research and Thesis). A thesis representing original research and a final oral examination are required. A grade-point average of at least 3.0 must be maintained. In general, two years are needed to complete the M.S. program.

Doctor of Philosophy

Students with either a bachelor's or master's degree can apply to the Ph. D. program. Those with a bachelor's degree must complete the basic course requirements expected of an M.S. candidate. The doctoral candidate with an M.S. degree from another department must have had course work or demonstrate knowledge in microbiology, immunology, and biochemistry equivalent to that of a master's student in the department. In addition, the doctoral student will take additional course work as determined by the student's graduate research advisory committee. A minimum of nine hours in Microbiology 491 courses or selected advanced courses from other departments is required. Where appropriate, course work in related subjects such as computer science, cell biology, biochemistry, physical chemistry, and statistics will be required. M.Bio 496 Seminar is a required course each semester that the student is in residence. The student will maintain a grade point average of 3.0. The Doctor of Philosophy program requires a dissertation representing the results of an original research investigation and the passing of a written qualifying and a final oral examination. The qualifying examination is given at the end of the first year of study. The final oral examination is given after completion of research and an acceptable dissertation. All full-time students are required to participate in teaching at least one semester a year. Three years are usually needed to complete the Ph.D. program.

Additional Information

The Department of Microbiology and Immunology has informal journal clubs in immunology and in microbiology. These are designed to help the students develop skills in reading, interpreting and discussing current research articles. All students are expected to participate in one or more.

For application materials, a description of faculty research interests, guidelines for graduate students in the Department of Microbiology and Immunology, write to the Chairperson, Admissions and Scholarship Committee, Department of Microbiology and Immunology, WVU Health Sciences Center, Morgantown, WV 26506.

Research and Instruction

Pathogenic Bacteriology: mode of action of microbial products in pathogenicity; identification and classification of anaerobic microorganisms including filamentous bacteria; oral microbiology; ecology of the oral cavity.

Mycology: pathobiology of medical mycoses; environmental health implications of fungal and algal toxicoses.

Physiology: nutrition and metabolism of a variety of pathogenic microorganisms, growth and protein synthesis in obligate intracellular bacteria.

Genetics: basic studies in the mechanisms of genetics including transfer of genetic information; recombinant DNA studies.

Virology: Cytomegalovirus molecular genetics; glycoproteins in cytomegalovirus infection, papilloma virus diseases; bacteriophage-host interactions.

Parasitology: host-parasite relationships between helminth parasites and insects and vertebrate hosts; endosymbionts in protozoa.

Immunology: immunopathology of pulmonary disease; inflammatory response to inhaled organisms; developmental aspects of immunity, mechanisms of T-cell function.

Other programs: detection of environmental pollutants; effect of environmental agents on host resistance.

Microbiology (M. Bio.)

220. **Microbiology.** (For pharmacy students.) II. 4 hr. PR or Conc.: Biochemistry. Pathogenic microorganisms, including immunology and antimicrobial agents.

223. **Microbiology.** (For medical technology students; other students with consent.) II. 5 hr. PR or Conc.: Organic chemistry. Basic microbiology. Emphasis on immunology, pathogenic microorganisms, and clinical laboratory techniques.

224. **Parasitology.** (For medical technology students; other students with consent.) II. 4 hr. Study of animal parasites and disease vectors with emphasis on disease manifestations, parasite biology and laboratory diagnosis.

301. **Microbiology.** (For medical students and a limited number of graduate students in health science basic science departments.) I. 5-7 hr. PR: Organic chemistry, biochemistry. Detailed study of pathogenic microorganisms and immunology. Emphasis on use of microbiology in solving clinical problems.

302. **Microbiology.** (For dental students only.) I. 5 hr. PR: Organic chemistry. Detailed study of pathogenic microorganisms. Emphasis on oral flora.

310. **Structure and Activities of Microorganisms.** II. 3 hr. PR or Conc.: Biochemistry, consent. Molecular biology of *E. Coli* and other selected organisms.

317. **Special Problems in Microbiology.** I, II, S. 1-7 hr. per semester.
A. **Special Problems in Basic Immunology.** I. 2 hr. PR: Consent.
B. **Special Problems in Microbiology.** I, II, S. VR. PR: Consent.
C. **Special Problems in Post Graduate Dental Microbiology.** II. 4 hr. PR: Consent.

327. **Parasitology.** (For graduate students.) II. 4 hr. PR: Consent. Study of animal parasites and disease vectors with emphasis on disease manifestations, parasite biology, laboratory diagnosis, and current concepts in parasitological research.

391. **Advanced Topics.**
A. **Laboratory Rotation.** I. 3 hr. PR: Consent; For graduate students in Microbiology and Immunology. Assigned study to develop research laboratory techniques. (Graded as S or U.)
B. **Immunology.** I, II, S. VR. PR: Consent. Independent study in immunology.

397. **Master's Degree Research or Thesis.** I, II, S. 1-15 hr. PR: Graduate students in Microbiology and Immunology. Students may enroll more than once. (Graded S or U.)

490. **Teaching Practicum.** I and II. 1-3 hr. PR: Consent. Supervised practices in teaching of microbiology. (Graded as S or U.)

491. Advanced Study.

Pathogenic Bacteriology. I. 2 hr. PR: M. Bio. 301, 310 or equiv. Consent. Pathogenic bacteriology with an emphasis on the mechanisms of pathogenesis. Topics include microbial adherence, toxin production and mechanisms, and normal flora and disease.

Clinical Laboratory Bacteriology. II. VR. PR: M. Bio. 301, 310, or equiv. Consent. Lectures on the identification of pathogenic microorganisms with an emphasis on bacteria. The laboratory includes a rotation through the hospital clinical microbiology laboratory. Limited enrollment. (Graded as S or U.)

Molecular Genetics. I. 3 hr. PR: M. Bio. 310 or equiv. Consent. Molecular aspects of mutation, gene transfer mechanisms, genetic mapping, and genetic control using bacteria and bacteriophage systems as models.

Microbial Metabolism. II. 2 hr. PR: M. Bio. 310, or equiv., biochemistry, consent. Physiology, metabolism, and regulation of representative microbial groups.

Microbial Metabolism Laboratory. II. 1 hr. PR: Open to departmental graduate students only. Research techniques in metabolic regulation.

Medical Mycology. I. 3 hr. PR: Consent. Advanced study of fungi of medical importance, including the pathobiology of mycoses and toxicoses.

Molecular Virology. I. 3 hr. PR: M. Bio. 310, 301, or equiv., consent. Molecular biology of viruses that are of importance or important both biological and medically. Includes a basic introduction to replication and genetics as well as current topics in molecular virology.

Developmental Immunology. I. 3 hr. PR: Consent. Examines the development of the lymphoid components of the immune system (B and T lymphocytes) and interactions leading to effective immune responses.

Cellular and Genetic Basis of the Immune Response. I. 3 hr. PR: Consent. Emphasis is on contemporary issues in understanding the genetic and cellular elements that impact immune responses.

Contemporary Topics in Immunobiology II. 3 hr. PR: Consent. Detailed coverage of major issues of contemporary research in immunobiology.

Systems Immunology II. 3 hr. PR: Consent. An integrative systems approach to immunology stressing how immunologic recognition is translated into biologic consequences. Advanced treatment of different aspects of the effector arm of immune responses.

496. Seminar. I, II. 1 hr. PR: Graduate students in Microbiology and Immunology. (Graded as S or U.)

497. Ph.D. Research or Dissertation. I, II, S. 1-15 hr. Students may enroll more than once. (Graded as S or U.)

MINERAL AND ENERGY RESOURCES

Syd S. Peng, *Acting Chairperson, Department of Mineral Processing Engineering*
365A COMER Building

Graduate Faculty: Members Cho and Muter.

Thomas F. Torries, *Acting Chairperson, Department of Mineral Resource Economics*
341A COMER Building

Graduate Faculty: Members Collins, Colyer, Fletcher, Labys, Miernyk, Norton, Phipps,
Rose, and Torries.

Degrees Offered: Master of Science, Doctor of Philosophy

Mineral and Energy Resources Option

Mineral Resource Economics Option

Master of Science

The Departments of Mineral Resource Economics and of Mineral Processing Engineering in the College of Mineral and Energy Resources offer programs leading to the master of science. The Department of Mineral Resource Economics offers a Ph.D. in mineral and energy resources. Within these programs, several options and areas of emphasis or specialization are available. To apply for admission to any one of these programs, an applicant must first apply to the Office of Admissions and Records for admission to the University as a graduate student. If an applicant's credentials meet University criteria for admission, the office forwards the application to the faculty of the College of Mineral and Energy Resources for admission to the program.

A master's degree from the Department of Mineral Resource Economics or from the Department of Mineral Processing Engineering requires a total of 24 credit hours, a thesis for an additional six credit hours, and the maintenance of an overall 3.0 average. No course with an earned grade of less than C counts toward the 24 credit hour total. At least 60 per cent of course work must be in 300 or 400 level courses; 40 per cent may be from 200 level courses.

Faculty in mineral and energy resource economics cooperate with faculty in agricultural economics to offer coursework appropriate for students in both programs. Faculty also conduct joint research projects. Graduate students may select faculty in either program to serve on their thesis committee. Such cooperation strengthens the teaching and research of both programs and offers graduate students a wider range of selection in course work and thesis research issues. The programs also offer opportunities for interactions among graduate students and provides for broadened peer experience in study groups and in research discussions and seminars.

When students are accepted for graduate study, they meet with the program director so that individual graduate committees may be formed with the students' consent and input. A graduate committee, made up of three faculty members, meets with its student to plan a graduate program that will include the student's particular interest and career plans. After completion of a minimum of 12 credit hours of study with a minimum grade-point average of 3.0, the student may make formal application for candidacy for a degree. Faculty approval of this application makes the student eligible for the degree.

Academic Requirements

Each student will, with the approval of the student's graduate committee—appointed with the consent of the student within the first semester of registration—follow a planned program. The program contains a minimum of 24 hours of course work and six hours of independent and original study in the

minerals field leading to a master's thesis. At least 60 percent (18 hours) of the course credits must be from 300-level or 400-level courses while the remainder can be made up of 200-level courses.

Approval for candidacy for a graduate degree by faculty action is required to establish eligibility for a degree. A graduate student may request approval by formal application after completing a minimum of 12 semester hours of graduate courses with a grade-point average of at least 3.0 (B), based on all graduate courses in residence for which final grades have been recorded.

No credits are acceptable toward an advanced degree which are reported with a grade lower than C. To qualify for an advanced degree, a graduate student must have a grade-point average of at least 3.0 based on all courses completed in residence for graduate credit. Each candidate for a degree must select a major subject and submit a thesis showing independent, original study in the minerals field.

Doctor of Philosophy

The primary objective of the Ph.D. program offered by the Department of Mineral Resource Economics is to educate men and women so that they are fully capable of meeting the demands of the highest levels of their professions. The mineral resource economics concentration leads to a Ph.D. in mineral and energy resources.

The Ph.D. program in mineral and energy resources accepts applicants with either baccalaureate or masters degrees in engineering, earth sciences, or physical sciences. Students completing the program are qualified for careers with research institutes, industry, governmental agencies concerned with mineral and energy resource use, technical management of mining, petroleum, and natural gas firms, and for leadership roles in the field of mineral economics.

Mineral and Energy Resources (M.E.R.) for the Mineral Resource Economics Option

245/345. *Energy Economics.* I, II. 3 hr. Analysis of the energy sector and its relationship to the rest of the economy. Emphasis on current policy issues: OPEC, energy security, deregulation, hard vs. soft paths, impediments to coal use. (May not be taken for both undergraduate and graduate credit.)

260/360. *Resource Appraisal and Exploration Decisions.* I. 3 hr. Appraisal techniques for mineral resources including deposit, project, and regional evaluation. Exploration decisions and Bayesian analysis. (May not be taken for both undergraduate and graduate credit.)

303. *Economic Analysis of Mineral Markets.* I. 3 hr. Microeconomic theory applied to mineral demand, supply, prices, trade, and industrial organization. Forecasting techniques incorporating risk and uncertainty developed to analyze mineral markets.

307. *Mineral Policy Analysis.* II. 3 hr. PR: M.E.R. 360 or 365. Economics of mineral resources and public policy decisions; problems and effects of regulation and taxation; forms of government taxation and participation; mineral rents.

309. *Quantitative Methods in Mineral Economics.* I. 3 hr. PR: Stat. 101 or Econ. 125. Probability and statistical techniques for mineral economics. The development and application of computer programs; mineral market models, time-series forecasting techniques, input-output analysis, geostatistical methods, project analysis. 2 hr. lec., 1 hr. lab.

331. *Minerals Technology Assessment.* II. 3 hr. Methods of studying the effects of modifications in technology on the production or utilization of minerals, and the effects on mineral demand, supply, substitution, and markets.

341. *Economics of the Metal Industries.* II. 3 hr. Supply, demand, structure, production, technology, costs, prices, and problems of the metals industry.

342. *Economics of Industrial Mineral Industries.* I. 3 hr. Supply, demand, structure, technology, costs, prices, and problems of the industrial mineral industries.

365. *Mineral Finance.* II. 3 hr. Methods, risks, and problems of financing mineral projects. Large foreign-project financing, concerns of host governments, multinational mining concerns, and financial institutions.

394. *Special Topics in Mineral Economics.* I, II. 3 hr. PR: Consent. Selected economic problems in petroleum and natural gas engineering and the mineral industries.

397. *Master's Degree Research or Thesis.* I, II, S. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

403. *Theory of Resource Economics.* II. 3 hr. Allocation and distribution of natural resources in static and dynamic contexts. Welfare economics, cost-benefit analysis, and optimal control approaches. Applications to resource valuation, exhaustion, taxation, and regulation in theory and practice.

435. *Resources and Development Planning.* I, II. 3 hr. Role of natural resources in the economic development of the U.S. and lesser developed countries. Input-output and programming models and their linkage to econometric and computable general equilibrium models.

438. *Models of Mineral Commodity Markets.* II. 3 hr. PR: Econ. 325, 326. Applies advanced econometric methods to specification, estimation and simulation of dynamic models of domestic and international fuel and non-fuel mineral markets and industries. Programming and forecasting techniques.

447. *Oil and Gas Industry Economics.* I. 3 hr. PR: Consent. Analysis of the various stages of the oil and gas industries. Combines geology, engineering, and economic theory to evaluate industry structure and performance.

448. *Economics of the Coal Industry.* I, II. 3 hr. Supply, demand, structure, production, technology costs, prices and problems of the coal industry. Includes environmental, productivity, and transportation issues.

453. *Resources in Trade and Development.* I. 3 hr. PR: Econ. 211, 212; Econ. 250 recommended. Causes and consequences of international mineral trade and investment. Commodity market structures, trade expansion, stabilization, and host government-foreign investor relations. Impact of resource production, processing and exports on macroeconomic development.

457. *Energy and Regional Development.* I, II. 3 hr. Role of energy resources in regional development. Role of energy in the West Virginia economy and various regions of the U.S.

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

495. *Graduate Seminar.* I, II. 1-4 hr. PR: Consent.

497. *Graduate Research.* I, II. 1-4 hr. PR: Consent.

M.E.R. for Mineral Processing Engineering

310. Advanced Hydrometallurgy. I. 3 hr. PR: M.P.E. 221 or consent. Advanced concepts of hydrometallurgy. Recent technology of leaching, concentration, recovery of metal and mineral values, various mechanisms of leaching of minerals. Techniques such as continuous ion exchange, thermal precipitation, and current electrolytic technology.
317. Advanced Coal Preparation. II. 3 hr. PR: M.P.E. 217 or consent. The origin and distribution of mineral matter in coal including specific gravity distributions. Fine grinding and beneficiation by flotation technology. Coke blending, solid waste disposal, and advanced plant design.
318. Advanced Mineral Processing. II. 3 hr. PR: M.P.E. 219, 220, or consent. Advanced surface phenomena techniques including rigorous treatment of electrokinetic measurements and applications. Advanced concepts of collector adsorption on minerals and flotation response.
320. Modeling of Mineral Extraction Processes. I. 3 hr. PR: Consent. Theory of particle size distribution functions and population balance models, size reduction kinetics and interphase transfer kinetics and application to the separation of dissimilar solids by physical and chemical methods.
324. Advanced Special Topics. I and II. 1-6 hr. PR: Consent. Special advanced problems in mineral process engineering including choices among topics related to coal preparation, conversion, and process metallurgy.

Mineral Processing Engineering (M.P.E.)

217. Coal Preparation. I, II. 3 hr. PR: Math. 16, Chem. 16. Formation of coal, rank classification of coal, coal petrography, principles of preparing and beneficiating coal for market with laboratory devoted to sampling, screen analysis, float and sink separation, and use of various types of coal cleaning equipment. 2 hr. lec., 3 hr. lab.
218. Mineral Processing. II. 4 hr. PR: Math. 17 or consent. Application of particle characterization, particle behavior in fluids, industrial sizing, size reduction and fluid-solid separations are discussed. Introduction to froth flotation, and magnetic and electrostatic separation for the concentration of minerals is described. 3 hr. lec., 1 hr. lab.
219. Surface and Interfaces. I. 3 hr. PR: M.P.E. 218. Surface tension phenomena, surface thermodynamics, electrical double layer, polarized and nonpolarized electrodes, insoluble monolayers, adsorption phenomena, colloidal foams, and emulsion consideration as applied to mineral surfaces.
220. Mineral Flotation. II. 4 hr. PR or Conc.: M.P.E. 219. The application of surface phenomena for the beneficiation of minerals, including naturally hydrophobic, insoluble oxides, and semi-soluble and soluble minerals. Activation and depression of sulfide minerals. Engineering and design of flotation circuits. 3 hr. lec., 1 hr. lab.
221. Hydrometallurgy. II. 4 hr. PR: Chem. 141, 142; Conc.: M.A.E. 101. Electrochemical aspects and rates of solid-liquid reactions as applied to leaching, concentration, and recovery of minerals. Solvent extraction, ion exchange, electrowinning, and other current industrial processes.
222. Rate Phenomena in Extractive Metallurgy. I. 3 hr. PR or Conc.: M.A.E. 114; Chem. 141, 142. Momentum, heat and mass transfer phenomena theory; concepts of boundary layers and techniques of process analysis as applied to metallurgical reaction systems. 3 hr. lec.

224. *Mineral Problems.* I, II. 1-6 hr. PR: Senior or graduate standing or consent. Special problems considered in minerals beneficiation and processing, including choices among design and research projects in coal preparation, coal conversion, hydro- and extractive metallurgy or mineral economies.

250. *Control Systems in Mineral Processing.* II. 3 hr. PR: Junior standing in mineral processing engineering. Instrumentation and automatic control systems used in today's mineral processing technology are studied including data recording and control and process optimization. 3 hr. lec.

270. *Design and Synthesis.* I, II. 3 hr. PR: M.P.E. 217, 219; M. 281. The logic and quantitative tools required for synthesizing mineral processing systems are used on a realistic problem by students working independently. Specific attention is given to economic and environmental implications. 3 hr. lec.

Minerals (M.)

281. *Applied Mineral Computer Methods.* I, II. 3 hr. PR: M. 2; Math. 16. Problem solving in mineral processing, mineral resources, mining, and petroleum and natural gas engineering. Emphasis on applications using various computing technologies.

MINING ENGINEERING

Syd S. Peng, Chairperson of the Department
365A COMER Building

Degrees Offered: Master of Science in Engineering of Mines
Doctor of Philosophy

Graduate Faculty: Members Adler, Grayson, Khair, Peng, Rollins, and Wang.

Master of Science in Engineering in Mines (M.S.E.M.)

A student desiring to take courses for graduate credit at the master's level in the College of Mineral and Energy Resources must first apply for admission and state the major field.

An applicant with a baccalaureate degree in mining engineering will be admitted on the same basis as graduates of WVU. Lacking these qualifications, the applicant must first fulfill the requirements of the Department of Mining Engineering.

Academic Standards. Each student will, with the approval of the student's graduate committee—appointed with the consent of the student within the first semester of registration—follow a planned program. The program contains a minimum of 24 hours of course work and 6 hours of independent and original study in mining engineering leading to a master's thesis. At least 60 percent of the course credits must be from 300-level or 400-level courses while the remainder can be made up of 200-level courses.

Approval for candidacy for a graduate degree by faculty action is required to establish eligibility for a degree. A graduate student may request approval by formal application after completing a minimum of 12 semester hours of graduate courses with a grade-point average of at least 3.0 (B), based on all graduate courses in residence for which final grades have been recorded.

No credits are acceptable toward an advanced degree which are reported with a grade lower than C. To qualify for an advanced degree, a graduate student must have a grade-point average of at least 3.0, based on all courses completed in residence for graduate credit. Each candidate for a degree must select a major subject and submit a thesis showing independent, original study in mining engineering.

Doctor of Philosophy in Mineral Engineering (Ph.D.)

The principal objective of the Ph.D. program in mineral engineering is the education and training of men and women so that they are capable of attaining the highest levels of the mineral engineering profession and performing the professional roles of developing or improving the efficient extraction of solid mineral resources. The two areas of specialization are mine systems, and rock mechanics and ground control.

All applicants must have earned a M.S. degree in mining engineering with a grade-point average (GPA) of 3.5 or higher. The Graduate Record Examination (GRE) is required, and the applicant must have scored in the 75th percentile or higher for quantitative and analytical analysis. For all foreign applicants whose native language is not English, a TOEFL test score of 550 or better is required. In addition, each applicant is required to submit at least three letters of recommendation, one of which must be from the applicant's previous thesis adviser or an academic equivalent. All letters of recommendation should evaluate the student's potential for performing independent doctoral-level research.

The Ph.D. program in mineral engineering consists of 54 hours of course work and 36 hours of independent research beyond a bachelor's degree in mining engineering. The successful completion of a qualifying examination and an approved dissertation are also required.

Engineering of Mines (E.M.)

204. *Mining Methods for Vein Deposits.* I. 3 hr. PR: M. 2, Geol. 151, Math. 16. Methods and systems of mining other than flat seams. Emphasis on selection of methods in relation to cohesive strength of ore bodies and their enclosing wall rocks. Mining of anthracite included.
206. *Mining Exploration.* I. 3 hr. PR: E.M. 103, 104, Phys. 12, Math. 16. All phases of mineral exploration. Geological and geophysical methods, exploration drilling, data reduction and interpretation, preliminary feasibility studies and evaluation.
207. *Longwall Mining.* II. 3 hr. PR: E.M. 104. Elements of longwall mining including panel layout and design considerations, strata mechanics, powered supports, coal cutting by shearer or plow, conveyor transportation, and face move.
211. *Ground Control.* II. 3 hr. PR: E.M. 103, 104, M.A.E. 41, 43, Geol. 151. Rock properties and behavior, in situ stress field, mine layout and geological effects; designs of entry and pillar and roof bolting, convergence of openings and surface subsidence engineering.
214. *Rock Mechanics.* I. 3 hr. PR: M.A.E. 43 or consent. Elastic and plastic properties of rock, Mohr's criteria of failure, elastic theory, stress distributions around underground openings, open pit and underground stability, rock testing techniques.
224. *Special Subjects for Mining Engineering.* I, II. 1-6 hr. PR: Senior or graduate standing or consent. Special problems in mining engineering, including choices among operations research, mine systems analysis, coal and mineral preparation, and coal science and technology.
225. *Mine Equipment Design.* II. 3 hr. PR: E.E. 101, E.M. 104, Chem. 16, M.A.E. 43; junior standing. Analysis of equipment requirements for mining functions; design of specific equipment components and operations; and optimization of equipment and layout choices. Course will focus on equipment.
226. *Mine Machinery.* I. 3 hr. PR: E.E. 101, E.M. 103, 104, M.A.E. 43, junior standing. Design and control of fixed and integrated excavating and bulk handling machinery. Analysis includes components, operation, production, and possible failure modes. Studied are conveyors, hoists, hydraulic transport, boring machines, longwalls, bucket wheel excavators, and dredges.

231. *Mine Ventilation*. I. 3 hr. PR: E.M. 104, M.A.E. 114. Engineering principles, purposes, methods, and equipment applied to the ventilation of mines.

242. *Mine Health and Safety*. II. 3 hr. PR: E.M. 103, 104. The nature of the federal and state laws pertaining to coal mine health and safety; emphasis will be placed on achieving compliance through effective mine planning, design, and mine health and safety management.

243. *Industrial Safety Engineering*. I. 3 hr. PR: Junior standing or consent. Problems of industrial safety and accident prevention, laws pertaining to industrial safety and health, compensation plans and laws, and industrial property protection.

251. *Explosive Engineering*. I. 3 hr. PR: Chem. 16, Phys. 12, M.A.E. 42. Theory and application of explosives, composition, properties and characteristics of explosives, blasting design fundamentals, legal and safety considerations.

271. *Mine Management*. II. 3 hr. PR: E.M. 103, 104. Economic, governmental, social, and cost and labor aspects of mining as related to the management of a mining enterprise.

276. *Mine and Mineral Reserve Valuation*. I. 3 hr. PR: Senior standing. Methods used to value mineral properties; factors affecting value of mineral properties.

286. *Fire Control Engineering*. II. 3-4 hr. PR: Senior standing. Aspects involved in the control from fire, explosion, and other related hazards. Protective considerations in building design and construction. Fire and explosive protection organization including fire detection and control. Lectures (3) and/or 3 hr. lab.

287. *Applied Geophysics for Mining Engineers*. I. 3 hr. PR: E.M. 103, 104, Phys. 12, Geol. 151 or consent. Origin of the universe and the planets, heat and age of the earth. Application of the science of geophysics in the location and analysis of earthquakes and in prospecting for oil and minerals.

291. *Mine Plant Design*. II. 3 hr. PR: E.M. 225, 226; senior standing. Layout, analysis, and detailing of the major mine installations and support facilities. Locations include: the surface plant, shaft and slope stations, section centers. Systems dealt with are bulk handling, power, ventilation, supplies, water, and personnel.

295. *Mine Systems Design*. I. 3 hr. PR: E.M. 103, 104, consent. Each student selects and designs a mine subsystem under specified conditions, including extraction, transportation, ventilation, roof control, exploration, plant design, surface facilities, etc. 2 hr. lec., 1 hr. lab.

296. *Mine Design*. II. 3 hr. PR: E.M. 206, 211, 225, 226, 231, 242, 271. Comprehensive design problem involving underground mining developments or surface plant or both, as elected by the student in consultation with instructor. Preparation of a complete report on the problem required, including drawings, specifications, and cost analysis.

311. *Advanced Ground Control—Coal Mines*. I, II. 3 hr. PR: E.M. 211 or consent. Ground and strata control for underground and surface coal mining, including slope stability and subsidence.

312. *Surface Subsidence Engineering*. II. 3 hr. PR: E.M. 211. Elements of surface subsidence engineering due to underground mining: theories of surface subsidence, characteristics and prediction of surface movements, and effects of surface movements.

316. *Advanced Rock Mechanics*. I. 3 hr. PR: E.M. 214 or consent. Testing techniques and interpretation, strength and fracture, classification, anisotropy, friction, jointed rock, fluid pressure, fragmentation, and excavation.

320. *Mobile Excavating and Materials Handling.* I. 3 hr. PR: Graduate standing and consent. Mobile mining equipment will be systematically analyzed as to functional, production, failure, and operational aspects. Included will be routine and innovative methods, and surface and underground applications, such as the hydraulic shovel and impactors.

321. *Integrated Excavating and Materials Handling.* II. 3 hr. PR: Graduate standing and consent. Integrated mining equipment will be systematically analyzed as to functional, production, failure, and operational aspects. Included will be routine and innovative methods, and surface and underground applications, such as the longwalls and monorails.

331. *Mine Ventilation Network Analysis.* II. 3 hr. PR: E.M. 231, M. 281, or consent. Theory and computational techniques for mine ventilation network problems with emphasis on computer-aided analysis of complex mine ventilation systems.

332. *Advanced Mine Ventilation.* II. 3 hr. PR: E.M. 231. Advanced topics in mine atmospheric control including control of methane, dust, humidity, and heat. Also covers leakage characteristics, fan selection, analysis of ventilation networks, and planning of mine ventilation system.

342. *Advanced Mine Health and Safety.* I. 3 hr. PR: E.M. 242 or graduate standing. Special emphasis will be placed on mine rescue, mine disaster prevention and organization, and mine property and equipment loss prevention.

351. *Explosive Engineering Design.* II. 3 hr. PR: E.M. 251 or consent. Rock drilling, total blast systems simulation, experimental studies in blast design, rock fracturing, chemical thermodynamics, kinetics, and reaction rates.

365. *Deterministic Methods for Mineral Engineers.* I. 3 hr. PR: Graduate standing or consent. Analysis and solution of mineral engineering problems which require use of deterministic models. Application of deterministic methods to mineral transportation, mineral resource allocation and extraction problems, and mine planning and equipment utilization problems.

366. *Stochastic Methods for Mineral Engineers.* II. 3 hr. PR: Graduate standing or consent. Application of stochastic methods to mineral engineering problems in equipment selection, renewal processes, mine ventilation, mine production, and mineral extraction.

391. *Advanced Mine Design.* I, II. 1-6 hr. PR: Graduate standing or consent. Advanced detail design and layout of coal mine plant, particularly incorporating new ideas of machines and mining methods.

394. *Special Topics.* I, II, S. 1-3 hr. PR: Graduate standing or consent. Selected field of study in mining engineering.

397. *Master's Degree Research or Thesis.* I, II, S. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

398. *Advanced Mine Design 1.* 1-6 hr. PR: E.M. 296. Detailed design of the components of coal mine subsystems including ground control, excavation and handling, and life support subsystems. 1-6 hr. lec.

399. *Advanced Mine Design 2.* 1-6 hr. PR: E.M. 296. Examination of the broad aspects of mine design for non-coal deposits. Consideration of deposits of various shapes, materials and qualities including country rock. Comparison of principles established for coal mine design. 1-6 hr. lec.

411. *Theories of Surface Subsidence.* 3 hr. PR: E.M. 312. Theories of surface subsidence due to underground coal mining including empirical, profile function, theoretical and physical modeling methods, and time factors. 3 hr. lec.

416. *Theory of Rock Failure*. I. 3 hr. PR: E.M. 214 or consent. Friction, elasticity, strength of rock, mechanism of brittle failure, factors affecting failure process, theories of failure, fracture propagation in rock, fracture toughness of rock and coal, fluid pressure, size, stress gradient, and time-dependent effects.

417. *Laboratory and Field Instrumentation*. I. 3 hr. PR: E.M. 211, 214, or consent. Principles and applications of strain gages and photoelasticity for stress analysis in rock/coal; displacement/velocity gages and accelerometer for ground motion; holography and acoustic emission for non-destructive tests.

418. *Rock Mechanics in Mine Design*. II. 3 hr. PR: E.M. 211, 214, or consent. Design process in mining engineering; design approaches for excavations in rock; input parameters for design; empirical, observational, and analytical methods of design; integrated designs. 1 hr. lec., 2 hr. lab.

451. *Theory of High Explosives*. II. 3 hr. PR: E.M. 351 or consent. The application of chemical thermodynamics and the hydrodynamic theory to determine properties of high explosives, chemical equilibria and calculation of detonation and explosion-state variables.

491. *Advanced Topics*. I, II, S. 1-6 hr. PR: Advanced graduate standing, consent. Selected field of study in mining engineering.

492. *Directed Study*. I, II, S. 1-6 hr. PR: Advanced graduate standing or consent. Directed study, reading, and/or research.

493. *Special Topics*. I, II, S. 1-6 hr. PR: Advanced graduate standing or consent. Contemporary topics selected from recent developments in mining engineering.

494. *Special Seminars*. I, II, S. 1-6 hr. PR: Advanced graduate standing or consent. Special seminars for advanced graduate students.

495. *Independent Study*. I, II, S. 1-6 hr. PR: Advanced graduate standing or consent. Faculty supervised study of topics not available through regular course offerings.

496. *Graduate Seminar*. I, II. 1 hr. PR: Consent. It is anticipated that each graduate student will present at least one seminar to the assembled faculty and graduate student body of the student's program.

497. *Research*. I, II, S. 1-15 hr.

499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use the University's facilities, and participate in its academic and cultural programs.

Minerals (M.)

281. *Applied Mineral Computer Methods*. I, II. 3 hr. PR: M. 2; Math. 16. Problem solving in mineral processing, mineral resources, mining, and petroleum and natural gas engineering. Emphasis on applications using various computing technologies.

MUSIC

Cecil B. Wilson, Chairperson of the Division of Music

Degrees Offered: Master of Music

 Doctor of Musical Arts

 Doctor of Philosophy

Graduate Faculty: Members Amstutz, Beall, Brown, Faini, Godes, Haller, Hudson, Lefkoff, Miltenberger, Paglialunga, Powell, Skidmore, Taylor, Trythall, Wilcox, and Wilkinson. Associate Members Catalfano, Coeyman, Crotty, Kefferstan, Peri, Thieme, Weigand, Winkler, and Wilson.

The Division of Music is an accredited institutional member of the National Association of Schools of Music, the only nationally recognized

accrediting agency for professional music instruction. All programs comply with objectives and guidelines as required by this organization.

Prospective graduate students in music are required to complete the appropriate curriculum of undergraduate study in music at WVU, or its equivalent at another institution of recognized standing. For acceptance into a degree program the applicant must submit the following to the Director of Graduate Studies, Division of Music, P.O. Box 6111, Morgantown, WV 26506-6111.

1. For the Master of Music degree, a transcript showing an average of at least 2.75 on all undergraduate study is required for regular admission; for the Ph.D. and D.M.A., a transcript showing an average of at least 3.0 on the master's degree or equivalent is expected;

2. Results of the Graduate Record Examination (not required of performance M.M. applicants);

3. Three letters of recommendation from individuals qualified to judge the applicant's potential success as a graduate student in music; the writers should submit the letters directly to the Director of Graduate Studies.

Applicants in performance and for the recital option in music education are also required to demonstrate, by audition or tape recording, a level of attainment in the principal performance area which is prerequisite to the curriculum sought. The evaluation of performance proficiency is based on technical ability, repertoire, and musicianship. A listing of representative material for each performance area, graded by proficiency level, is available upon request.

The audition for acceptance, when required, is assessed for general admission purposes. The estimated proficiency level must be confirmed by a jury examination at the end of the first semester of applied study. Credit in performance at the 400 level will count toward degree requirements only when the proficiency level prerequisite has been reached.

Applicants seeking acceptance as composition majors must submit representative compositions for evaluation and approval. Evidence of previous teaching or professional experience is desirable in the consideration of doctoral applicants. Admission to the Ph.D. program with a specialization in music education is contingent upon the receipt of evidence that the applicant has been a successful music teacher for at least three years. Such evidence may be in the form of a letter of recommendation from a school official.

Applicants accepted for degree study must take tests in theory and music history, and audition on piano. In addition, voice students take diagnostic tests in vocal literature, diction, and pedagogy. The results of these might indicate the need for remedial study, which must be completed before admission to candidacy. Applicants for the areas of theory and composition will be tested more specifically in counterpoint (both sixteenth and eighteenth century), form, instrumentation, and orchestration. Applicants seeking acceptance as composition majors also must submit representative compositions for evaluation and approval.

Applicants whose averages and test scores do not meet the qualifications outlined above may be considered for acceptance as provisional or non-degree students. If, upon completion of up to 12 semester hours of graduate study they have achieved a B (3.0) average, and after any previous undergraduate deficiencies or other conditions have been removed, such students may be accepted as degree students.

If a tape recording is submitted, it must be of a high quality and have clearly indicated the student's name, titles and composers of works performed,

and recording date. Even the best recordings leave much to be desired, and a personal audition is encouraged. The auditions are normally administered at individually scheduled appointments, occurring at least six weeks before registration.

Master of Music (M.M.)

Candidates must establish an overall grade-point average of 3.0 within a maximum of 30 or 36 hours, depending upon the requirements of the chosen curriculum. Applicants are considered for candidacy upon the completion of 12 semester hours of graduate study. No student is admitted to candidacy before removal of all undergraduate deficiencies. A 3.0 average in all students work must be maintained.

Candidates for the Master of Music degree may major in one of five fields: music education, performance, theory, composition, or history of music. The latter four require a minimum of 30 hours.

Students majoring in music education are allowed one of four options, to be determined in consultation with the program consultant: (1) thesis option; (2) recital option (if the candidate demonstrates proficiency level 8 in the major performance area within the first 12 hours of enrollment); (3) thirty-six course-work hour option; and (4) certification option (intended for persons possessing a bachelor's degree with a major in music other than music education), leading to eligibility for certification for teaching grades K-12 in the public schools of West Virginia. For the first three options the following requirements apply:

1. Thirty graduate hours for thesis and recital options, 36 graduate hours otherwise, with an average of 3.0.
2. For the thesis or 36-hour options, four hours of performance, either Music 400 (principal performance area) or Music 310 (secondary performance area.)
3. Demonstration of the ability to integrate music history, music theory, and music education by passing comprehensive written and oral examinations.
4. Successful completion of a four credit thesis or two credit recital for the thesis and recital options, respectively.

For the certification option, a combination of graduate and undergraduate courses are selected to satisfy certification requirements. The 36 graduate hours are include 12 hours of graduate music education courses and electives chosen to provide a good background for teaching. Undergraduate courses may be necessary to make up deficiencies, especially in areas of performance or conducting. A descriptive leaflet is available upon request.

History of Music

Hr.

(PR: Level 7 in the major performance area; Level 4 on piano; four semesters of a foreign language; seven hours upper-division theory; 15 undergraduate hours in music history.)

Music 430—Introduction to Music Bibliography	3
Music History, chosen from Music 221-225	6
Music 491—Special Topics	6
Theory Elective	3
Music 497—Research (Thesis)	4
Electives (at least four credits in music)*	8
Total	30

*Students in the Thesis option must include Music 446.

Music Education

Hr.

(PR: Level 2 in piano.)

Music Education courses at the 300 or 400 level*	12
One Theory course and one Music History course	5-6
<i>For Thesis Option:</i>	
Music 400 or 310—Performance	4
Music 497—Research (Thesis)	4
Electives	4-5
<i>For Recital Option:</i>	
Music 398—Master's Recital	2
Music 400—Applied Music (major performance area)	6
Electives	4-5
<i>For 36-hour Option</i>	
Music 400 or 310—Applied Music	4
Electives	<u>14-15</u>
Totals	<u>30 or 36</u>

*Students in the Thesis option must include Music 446.

Performance

Hr.

(PR: Level 10 in the major performance area, and Level 3 in piano; for organists, Level 5 in piano; for pianists in the piano pedagogy option, Level 9 in piano and one year of piano pedagogy/group or equivalent teaching experience; for voice majors, the same language requirements as those for the B.M. degree.)

Music 400—Performance (major area)	8
Music 430—Introduction to Music Bibliography	3
<i>For Performance Option:</i>	
Music 398—Master's Recital	4
One of the following	2
Music 398—Master's Recital	
Music 431—Research Problems for Performers	
One theory course and one music history course	5-6
Music electives	
(no more than four hours in major performance area)	<u>7-8</u>
Total	<u>30</u>

For Piano Pedagogy Option:

Music 398—Master's Recital	2
Music 312—Studies in Keyboard Performance and Pedagogy	6
Music 392—Guided Studies (Teacher Internship)	4
One theory course or one music history course	2-3
Music electives	4-5
Total	<u>30</u>

Composition

НГ.

(PR: Level 8 in the major performance area; Level 4 in piano; evaluation of previously completed compositions at a graduate major level.)

Music 430—Introduction to Music Bibliography	3
Music 460—Composition	6
Music 468—Compositional Techniques in Contemporary Music	3
Music 475—Pedagogy of Theory	3
Music 483—Theory Topics	3
Music 497—Research (Thesis)	4
Music electives (must include one of the following:	
Music 460—Electronic Music Composition	
Music 467—Analytical Techniques	
Music 470—Transcription and Arranging)	8
Total	30

Theory

Hr.

(PR: Level 8 in the major performances area; Level 4 in piano.)

Music 430—Introduction to Music Bibliography	3
Graduate music history	3
Music 467—Analytical Techniques	3
Music 468—Compositional Techniques in Contemporary Music	3
Music 475—Pedagogy of Theory	3
Music 483—Theory Topics	3
Music 497—Research (Thesis)	4
Electives (at least four credits in music)	8
Total	30

*To be eligible for graduation, the candidate must demonstrate attainment of Level 8 on the major instrument.

A representative public recital is required of candidates majoring in Applied Music. Composition majors must submit as a thesis a composition in a large form.

All candidates for the Master of Music degree are required to participate for credit for two semesters (or summer sessions) in a performing group which meets at least two clock hours per week and which is selected with the adviser's approval.

A general comprehensive oral examination must be passed by all candidates or the Master of Music degree. Unsuccessful candidates may repeat this examination after a three-month period. The results of the second oral examination will normally be considered final. The examining committee will decide immediately after an unsuccessful second attempt whether a petition for a third attempt will be granted.

Time Limitation. Students must complete their programs in eight calendar years. Failure to do so will result in the loss of credit for courses taken at the outset of the program.

Doctor of Philosophy (Ph.D.)

Admission. Acceptance to the doctoral program is competitive; admissions decisions are made each year in the spring for entrance the following fall. Applicants to the program leading to the degree of Doctor of Philosophy must present necessary credentials for evaluation of previous training and experi-

ence to the Division of Music. These include a score on the Graduate Record Examination General Aptitude Test, submitted through the WVU Office of Admissions and Records, and evidence that the applicant has completed a minimum of 28 hours in liberal arts studies. Before admission to the program the Division may, at its discretion, require the applicant to take entrance tests in various fields of music, or it may require the applicant to be present for a personal interview. Under normal circumstances, the applicant must have maintained a minimum average grade of B in courses taken for the master's degree. However, if sufficient professional experience should warrant, the Division may waive the requirement of a B average or may grant an applicant conditional admittance subject to the satisfactory completion of certain specified courses or the attainment of a specified grade-point average within a semester's work.

Curriculum. The exact amount and nature of course work undertaken will be determined by the adviser with the approval of the student's doctoral committee in light of previous preparation and field of specialization. The student is expected to take Music 494—Doctoral Seminar—as required by the field of specialization. Whatever preparatory courses (languages, statistics, bibliography, etc.) are needed must necessarily be taken early in the course of study. A paradigm of recommended courses and other requirements in each field of specialization is available upon request.

Candidacy. Upon completion of the requirements of the Division of Music and the general WVU graduate studies requirements, the student will be recommended for admission to candidacy for the degree. These requirements are (in order of occurrence):

1. Demonstrate the ability to read German and French. For applicants in music education, either French or German 305-306, or Statistics 311-312 must be completed satisfactorily. Upon recommendation of the adviser, a different romance language may be substituted for French.

2. Pass written qualifying examinations satisfactorily to show:
 - a. Broad knowledge in theory and music history and literature.
 - b. Appropriate knowledge in the minor field.
 - c. Knowledge in depth in the field of specialization.

3. Pass satisfactorily a comprehensive oral qualifying examination.

4. Present and have accepted an outline and prospectus of the dissertation.

The requirement for doctoral seminars must be completed before the presentation of the prospectus.

Graduate students who have met these requirements and who have maintained an average of B in courses completed shall be admitted to candidacy. The qualifying examinations, administered after satisfaction of the language requirement, shall be considered as one integral examination consisting of the written and oral parts. If the first attempt is unsuccessful, the student is allowed to try the entire examination a second time. The second attempt is considered final. However, the applicant's committee may elect to discourage a second attempt if the first does not indicate probable success upon repetition.

Residence. Completion of the requirements for this degree normally requires at least three years of full-time graduate work. A minimum of two semesters must be spent in residence in full-time graduate study at WVU beyond the master's degree or its equivalent.

Dissertation. The candidate must submit a dissertation produced at WVU under the direction of a major professor which demonstrates a high order of

independent scholarship, originality, and competence in research, and which makes an original contribution to the field of specialization.

Final Examination. When the dissertation is approved and all other requirements have been fulfilled, the candidate's doctoral committee will administer the final oral examination. However, a final examination will not be given in the same semester as the qualifying examination. At the option of the student's committee, a final written examination may also be required. The final examination(s) shall be concerned with the dissertation, its contribution to knowledge, its relation to other fields, and the candidate's grasp of the field of specialization.

Time Limitation. Following admission to candidacy, doctoral students are allowed five years to complete all remaining degree requirements. An extension of time may be permitted only upon repetition of the qualifying examination and completion of any other requirements specified by the student's doctoral committee.

Doctor of Musical Arts

Program Objectives. The primary objective is professional competence at the highest level. Historical and theoretical knowledge sufficient to support individualized interpretations for performers and original creative work for composers is also expected. Writing and speaking skills needed to communicate clearly and effectively are required. To assist the student in achieving these objectives, the course of study includes requirements in performance or composition, academic course work, and research.

Admission. Acceptance into doctoral programs is competitive; admissions decisions are made each year in the spring for entrance the following fall. Applicants to the program leading to the degree of Doctor of Musical Arts (D.M.A.) must present necessary credentials for evaluation of previous training and experience. These include a score on the Graduate Record Examination General Aptitude Test, submitted through the WVU Office of Admissions and Records, and evidence that the applicant has a minimum of 28 hours in liberal arts studies. Before admission to the program the Division may, at its discretion, require the applicant to take entrance tests in various fields of music, or it may require the applicant to be present for a personal interview. Under normal circumstances the applicant must have maintained a minimum average grade of B in courses taken for the master's degree. However, if sufficient professional experience should warrant, the Division may waive the requirement of a B average or may grant an applicant conditional admittance subject to the satisfactory completion of certain specified courses or the attainment of a specified grade-point average within a semester's work.

Applicants in performance should submit copies of programs of recent major recitals. The applicant must be approved for the program by an audition committee by giving evidence of superior performance, artistic maturity, and extensive repertoire as specified under Graduate Applied Music Requirements. The audition committee will include the Chair of the Division of Music, the Director of Graduate Studies, the graduate program adviser in applied music, and the major professors involved with the area of specialization.

Applicants in composition must be approved for the program after evaluation by the composition faculty of scores of the applicant's works, accompanied by recordings if possible. These should show successful

handling of various forms and media and indicate the applicant's capacity to attain professional standing in the field.

Fields of Specialization. The degree of Doctor of Musical Arts may be taken in performance and literature (with specialization in piano, voice, or organ), or in composition.

Curriculum. The exact amount and nature of course work undertaken will be determined by the student's adviser with the approval of the doctoral committee in light of previous preparation and field of specialization. A paradigm detailing recommended courses and other requirements is available upon request.

Candidacy. Upon completion of the requirements of the Division of Music and the general WVU graduate studies requirements, the student will be recommended for admission to candidacy for the degree. These requirements are (in order of occurrence):

1. Demonstrate reading proficiency in a foreign language by successful completion either of an examination administered by the Division of Music or the equivalent of the fourth semester of recent language study with a minimum grade of B. Ordinarily, the language is French or German; exceptions may be allowed depending upon the needs of the student.

2. Pass written qualifying examinations satisfactorily to show:

- a. Broad knowledge in Theory and Music History and Literature.
- b. Knowledge in depth of the literature of the field of specialization or of the craft of composition.

3. Pass satisfactorily a comprehensive oral qualifying examination.

4. Present a public recital (performance specialization only).

Graduate students who have met these requirements and who have maintained an average of B in courses completed shall be admitted to candidacy. The qualifying examinations, administered after satisfaction of the language requirement, shall be considered one integral examination consisting of written and oral parts. If the first attempt is unsuccessful, the student is allowed to try the entire examination a second time. The second attempt is considered final. However, the applicant's committee may elect to discourage a second attempt if the first does not indicate probable success upon repetition.

Residence. Completion of the requirements for this degree normally requires at least three years of full-time graduate work. A minimum of two semesters must be spent in residence in full-time graduate study at WVU beyond the master's degree or its equivalent.

Performance requirements (for performance majors) include private lessons, master classes in applied repertory, and public performance of at least two solo recitals and other types of presentations appropriate for the preparation of an artist-teacher, such as chamber music programs, concerto performances, major roles in opera or oratorio, or major accompaniments. Credit for each public performance is established in advance by the student's committee.

Composition requirements (for composition majors) include private lessons and the creation of a composition portfolio. Credit for each composition is established by the student's committee prior to its completion; it will be subsequently evaluated on a pass-fail basis. Ten credits of the composition portfolio must be completed before admission to candidacy. Work on the major project must commence only after admission to candidacy.

Academic course requirements include courses in music history and theory, and, for performers, an appropriate course in the literature of the major performance area.

Research requirements are intended to develop theoretical and historical investigative techniques sufficient to enable the performer to develop valid individualized interpretations and to assist the composer in developing an original style. These requirements consist of the course "Introduction to Music Bibliography" (Music 430), demonstration of reading proficiency in either French or German, for composers a doctoral seminar, and for all students a research project culminating in an extended written study related to the student's area, although not necessarily constituting original research. This project will be supervised by a Regular Graduate Faculty member who is a member of the student's doctoral committee in consultation with the entire doctoral committee.

Final Examination (performance specialization only). The final examination will consist of a major solo recital (which will be regarded as the equivalent of the Ph.D. dissertation defense). Immediately following the public performance the candidate's committee will meet to evaluate the performance as evidence of mature musicianship and finished technique. Such a final examination recital will not be given in the same semester as the qualifying examination.

Final Examination (composition specialization only). When all compositions and the major project are approved and all other requirements have been fulfilled, the candidate's doctoral committee will administer the final oral examination. At the option of the committee, a written examination may also be required. The final examination(s) shall be concerned with the compositions, the major project, and the candidate's grasp of the field of specialization and its relation to other fields. The final examination will not be given in the same semester as the qualifying examination.

Time Limitation. Following admission to candidacy, doctoral students are allowed five years to complete all remaining degree requirements. An extension of time may be permitted only upon repetition of the qualifying examination and completion of any other requirements specified by the student's doctoral committee.

Music (Music)

200. *Directed Music Studies.* I, II, S. 1-4 hr. (May be repeated for credit.) PR: Consent. Studies in applied music, music education, music theory, music history, composition; includes directed or independent study in special topics.
210. *Piano Class Methods and Materials.* I. 3 hr. Methods, materials, and pedagogical techniques, including presentation of keyboard theory as used in functional piano. Practical organization of piano classes. Laboratory: observation of experienced class teacher and student teaching. (Not offered in 1990-91.)
212. *History of Keyboard Pedagogy and Technic.* II. 3 hr. Study of keyboard development and technique, including pedagogical works of the eighteenth through twentieth centuries and application to specific teaching problems. Laboratory: student teaching and observation, emphasizing analysis and solution of technical problems. (Not offered in 1990-91.)
213. *Introduction to Jazz Improvisation.* I. 2 hr. PR: Music 63, 64, and Proficiency Level 4. Development of improvisatory skills in the jazz idiom using melodic, harmonic, and rhythmic motives and patterns, and the application of knowledge of tonal centers, chord progressions, and functions.

214. *Advanced Jazz Improvisation.* II. 2 hr. PR: Music 213 or consent. Continuation of Music 213. Analysis of chord progressions with emphasis on chord substitutions, turnbacks, and scales. Development of jazz repertoire through performance.

218. *Repertoire.* I. 0-2 hr.

219. *Repertoire.* II. 0-2 hr.

221. *Music Before 1500.* I, II, or S. 3 hr. PR: Music 33-34 or consent. A study of sacred and secular monophony, Notre Dame organa, thirteenth-century motet and conductus, and fourteenth- and fifteenth-century polyphony in France and Italy.

222. *Music of the Sixteenth and Seventeenth Centuries.* I, II, or S. 3 hr. PR: Music 33-34 or consent. A study of styles and forms from the High Renaissance to the Late Baroque.

223. *Music of the Eighteenth Century.* I, II, or S. 3 hr. PR: Music 33-34 or consent. A study of styles and forms of the Late Baroque through the Classic period.

224. *Music of the Nineteenth Century.* I, II, or S. 3 hr. PR: Music 33-34 or consent. A study of styles, forms, and theoretical concepts illustrative of nineteenth-century music.

225. *Music of the Twentieth Century.* I, II, or S. 3 hr. PR: Music 33-34 or consent. A study of stylistic trends during the twentieth century. (spring 1990.)

226. *History of Jazz.* I. 3 hr. History and repertory of jazz from its Afro-American origins to c.1975 with attention to its major exponents (including Joplin, Armstrong, B. Smith, Morton, Ellington, Gillespie, Parker, Davis, Coltrane) and its evolving style.

230. *Music of Africa.* S. 3 hr. Traditional music of selected areas of Africa south of the Sahara with particular reference to East Africa. The diverse musical cultures with emphasis on historical background, instruments, ensembles, forms, and styles, and music in its social context.

239. *Collegium Musicum.* I, II. 1-2 hr. (May be repeated for credit.) PR: Consent. Study of outstanding musical works not in the standard repertory. Performance of vocal and instrumental music, investigation of performance practices, preparation of editions, and direction of rehearsals under supervision.

240. *Clinic Chorus, Band, and Orchestra.* I, II. 1 hr. Experience in selection, preparation, and class performance of music appropriate for high school choral and instrumental groups. (Not offered in 1990-91.)

243. *Music Workshops.* I, II, S. 1-2 hr. (May be repeated for credit.)

245. *Marching Band Techniques.* I. 2 hr. PR: One semester college marching band experience or consent. Study and practical application of techniques of planning and preparation of school marching band performances.

248. *Music Arranging for Public School Groups.* I, II. 2 hr. PR: Music 66. Practical experience in techniques of making simple, workable arrangements of music for public school choral and instrumental performance groups.

260. *Upper-Division Composition.* I, II. 2 hr. (May be repeated for credit.) PR: Two semesters Music 160, or consent based on scores submitted. Creative writing with emphasis on practical composition for performance.

263. *Counterpoint.* I. 2 hr. PR: Music 68 or consent. Sixteenth-century counterpoint.

264. *Counterpoint.* II. 2 hr. PR: Music 68 or consent. Eighteenth-century counterpoint.

265. *Analysis of Musical Form.* II. 3 hr. PR: Music 68 or consent. Detailed study of the structure of music.

267. *Electronic Music*. I. 2 hr. PR: Music 68 and consent. Technology of producing electronic music. Methods of producing electronic compositions, relationship between sound signal and sound perceived, ear training, analysis of examples from electronic music literature, and composition of electronic music.

268. *Electronic Music*. II. 2 hr. PR: Music 267. Continuation of Music 267.

273. *Arranging for Small Jazz Ensemble*. I. 2 hr. PR: Music 171, and Music 173 or consent. Scoring, voicing, and arranging in various jazz styles, with emphasis on small ensembles comprising three to nine players.

274. *Arranging for Large Jazz Ensemble*. II. 2 hr. PR: Music 273 or consent. Continuation of Music 273, with emphasis on arranging for big band and studio jazz ensemble.

310. *Secondary Applied Music*. I, II, S. 1 hr. (May be repeated for credit.) Group or individual instruction in performance on a minor instrument (or voice), with emphasis on methods and materials for school music teachers.

312. *Keyboard Performance and Pedagogy*. I, II. 1-3 hr. (May be repeated for credit.) (Offered in one credit modules of which students may take one or more each semester.) Pedagogy, repertoire, interpretation, and other topics which will enhance preparation of private piano teachers.

335. *Survey of Vocal Music*. I. 3 hr. PR: 6 hr. upper-division music history. Survey of masses, oratorios, cantatas and operas from late Renaissance to the twentieth century. Solo repertoire will not be included.

336. *Instrumental Music*. 3 hr. PR: 6 hr. upper-division music history or consent. Survey and analysis of orchestral and band music from the late Baroque to the present.

341. *Music in the Elementary School*. II. 3 hr. PR: Music 30, 41, 42, or equiv. (Not open to music majors.) Development of skills, procedures, techniques, and materials used by the general classroom teacher of music in grades K-8. (Not offered in 1990-91.)

342. *Teaching of Music Appreciation*. I. 3 hr. PR: Music 30, 41, 42, or equiv. (Not open to music majors.) Review of information, materials, sources, and techniques involved in teaching appreciation of music in public schools. (Not offered in 1990-91.)

343. *Contemporary Techniques in Classroom Music*. 3 hr. PR: Music 152 or consent. Principles and practice of contemporary techniques in elementary and junior high school classroom music, including those of Orff and Kodaly.

344. *Appalachian Music for the Classroom*. I. 3 hr. Lecture, demonstration, and practical experience in performance of Appalachian vocal and instrumental music and in use of this music in public school classrooms. May involve field trips and construction of inexpensive instruments.

346. *Musicmaking in Middleschool/Junior High*. II. 3 hr. PR: Music 151, 152, equiv., or consent. Identification and sequencing of appropriate concepts and skills for general music class students. Selection and use of materials including popular music. Emphasis on student music-making activities. Evaluation procedures included.

347. *Music in Early Childhood*. S. 3 hr. PR: Music 151, 152, or equiv., or consent. Musical experiences for children three through ten years. Emphasis on intellectual, physical and social/emotional needs and characteristics of children. Materials and activities for developing music concepts, skills, and positive response. (Offered summer 1990.)

392. *Guided Studies in Music*. I, II, S. 1-3 hr. PR: Graduate standing and consent. Intensive individualized reading reported in group discussions. Course may be repeated as many times as necessary, in as many areas as needed; different sections (i.e. areas) may be pursued simultaneously.

398. *Master's Recital.* I, II, S. 1-4 hr. PR: Music 299 (Senior Recital) or consent. Master's Applied students shall be permitted to give a recital only after they pass a qualifying audition before a designated faculty committee in a semester previous to that in which the recital is to be given.

400. *Applied Music.* I, II. 1-4 hr. (Open to qualified students in any field in Applied Music. May be repeated.) Normally offered for two credits (one 30-minute lesson per week) or four credits (one 60-minute) lesson per week. A student must demonstrate ability of grade-level 4 on an instrument to receive credit in Music 400 on that instrument.

409. *Master Class in Applied Repertoire.* I, II. 2 hr. (May be repeated for credit.) PR: Consent. Designed to give coverage through performance of the literature of a specific D.M.A. Applied Music field.

410. *Conducting.* S. 3 hr. PR: Music 53 or equiv. Instrumental and choral conducting. Major works are prepared and conducted through the use of recordings and music organizations.

419. *Opera Theatre.* I, II. 0-4 hr. PR: Music 19 or consent. Continuation of Music 19. Performance of major roles and advanced production techniques. Qualified students will undertake production-direction projects under supervision.

423. *Keyboard Literature.* S. 3 hr. PR: Music 218, 219. Intensive study of the literature for keyboard instruments and the history of the literature. (Not offered in 1990-91.)

424. *Song Literature.* S. 1-3 hr. PR: Music 218, 219. Intensive study of the Art Song and the Lied and the history of their development. (Not offered in 1990-91.)

428. *Aesthetics of Music.* II. 2 hr. PR: Music 33, 34 or consent. Examination of the main classical and contemporary aesthetic theories and their applications to music. (Not offered in 1990-91.)

429. *Survey of Sacred Music.* S. 4 hr. PR: Music 33, 34 or equiv. Study of music suitable to the liturgical year, including the historical background of the Jewish, Catholic, and Protestant liturgies. (Not offered in 1990-91.)

430. *Introduction to Musical Bibliography.* I. 3 hr. PR: Music 33 and 34 or equiv. Survey of musical bibliography with appropriate research assignments.

431. *Research Problems for Performers.* II. 2 hr. PR: Music 430. Discussion of problems of music literature, performance practice, history, and instruments; preparation of a research paper under individual supervision. (Not offered in 1990-91.)

438. *History of Notation.* II. 3 hr. PR: Graduate standing. Detailed study in transcribing the musical manuscripts of the Middle Ages. (Not offered in 1990-91.)

439. *History of Notation.* II. 3 hr. PR: Graduate standing. Continuation of Music 438 covering the Renaissance period. (Not offered in 1990-91.)

440. *Choral Techniques.* II. 2 hr. PR: Music 151, 152 or equiv. Advanced techniques and procedures involved in development of choral ensembles.

442. *Instrumental Techniques.* I. 2 hr. PR: Music 151, 152, or equiv. Advanced techniques and procedures involved in individual performance and instruction through lecture-demonstrations by applied music faculty.

443. *Historical Foundations of Music Education.* 3 hr. Examination of the history of music education from classical antiquity to the present, with particular emphasis on practices in the United States; examination and application of historical research methods. 3 hr. lec.

444. *Music Education.* II. 3 hr. PR: Music 151, 152 or equiv. Survey and critical study of the total music education program.

445. *Supervision of Music.* II. 2 hr. PR: Music 151 or 152, or equiv. Concepts, responsibilities, duties and techniques that the supervisor needs to effectively exercise leadership in developing, coordinating, and refining the complete Music Education program in public schools from kindergarten through twelfth grade. (Not offered in 1990-91.)

446. *Introduction to Research in Music Education.* I. 3 hr. PR: Music 151, 152, or equiv. Methods and measures necessary for conduct and understanding of research in music education.

448. *Psychology of Music Learning.* 3 hr. Application of learning theory to music learning; nature of musical talent; music talent testing.

449. *Psychology of Music.* II. 3 hr. Introductory study of musical acoustics and psychology of perception of music.

460. *Composition.* I, II. 3 hr. (May be repeated for credit.) PR: Consent. Primarily for candidates for graduate degrees in theory or composition.

467. *Analytical Techniques.* I, II, or S. 3 hr. Analytical techniques and their application to scholarship and performance, with emphasis on pre-twentieth century styles. (Offered fall 1991-92.)

468. *Compositional Techniques in Contemporary Music.* I, II, or S. 3 hr. Analysis of twentieth-century music with emphasis upon music composed since 1950. (Offered in spring 1991-92.)

470. *Transcription and Arranging.* I, II. 2 hr. (May be repeated once for credit.) PR: Music 172 or equiv. Major projects in scoring for orchestra, band, or wind ensemble.

475. *Pedagogy of Theory.* I, II, or S. 3 hr. PR: Music 68 or consent. Consideration of various approaches to the teaching of theory. (Offered fall 1990-91, summer 1991.)

483. *Theory Topics.* I, II, or S. 3 hr. (May be repeated for max. 8 hr. credit.) Various types of analytical and theoretical problems and approaches to their solutions. (Offered spring 1991-92, summer 1992.)

491. *Special Topics.* I, II. 1-3 hr.

492. *Advanced Studies in Music.* I, II. 1-8 hr. PR: Consent, which in some cases may be contingent upon doctoral foreign language examination or a course in statistics. Intensive individualized reading reported in group discussions. Course may be repeated as many times as necessary, in as many areas as needed; several different sections (i.e., areas) may be pursued simultaneously.

494. *Doctoral Seminar.* I, II. 2 hr. (May be repeated for max. 8 hr. credit.) PR: Consent. Intensive individual investigation and preparation of research papers. Presented by the combined doctoral staff in music.

496. *Lecture Recital.* I, II. 2 hr. PR: Music 430.

497. *Research.* I, II. 1-15 hr. PR: Music 430 or consent.

498. *Doctoral Recital.* I, II, S. 1-4 hr. PR: Music 398 (Master's Recital) or consent. Master's Applied students shall be permitted to give a recital only after they pass a qualifying audition before a committee of at least three specialists in the area in a semester previous to that in which the recital is to be given. Acceptance of the recital will be at the discretion of the student's doctoral committee.

NURSING

Lorita D. Jenab, *Dean of School of Nursing*
1144 Health Sciences Center

Degree Offered: Master of Science in Nursing

Graduate Faculty: Members M. Counts, M. J. Smith, and J. Wang. Associate Members P. Deiriggi, Jenab, L. Ostrow, T. Schaal, P. Simoni, and J. Stemple

Master of Science in Nursing

The School of Nursing offers a program of study leading to the master of science in nursing (M.S.N.) degree to prepare the professional nurse for the role of nurse clinician in the advanced practice of nursing in primary health care. The program, which is administered by the graduate academic unit, is offered at the University main campus in Morgantown and at selected extension sites.

The MSN program has as its purpose the preparation of professional nurses to: assume advanced roles in the delivery of health care; contribute to nursing science; and build a foundation for post-master's study. Upon completion of the program, the graduate is expected to:

1. Practice nursing based on the conceptual model of the health of human systems dynamically interacting with the environment.
2. Synthesize theory, practice, and research in developing the professional role of advanced nurse clinician.
3. Demonstrate accountability for health maintenance and promotion to self, the discipline, and society.
4. Utilize systematic inquiry to guide decision-making related to critical issues impacting clients, the profession, and society.

Designed in an integrative fashion, this non-traditional graduate program offers a curriculum model which allows students to enroll on a part-time or full-time basis. Throughout the curriculum, students are guided in self-development aimed at pursuing excellence in scholarly and professional endeavors. Flexibility within the basic curricular structure is offered through the individualization of learning experiences, electives, and the opportunity to investigate an area of interest in advanced study.

The individual student study plan is determined in consultation with a faculty adviser and is based upon the student's background and goals. The program can be completed in four semesters of full-time study at the Morgantown campus, averaging a load of 9-12 credit hours per semester.

The program is accredited by the National League for Nursing.

Admission Requirements

The applicant must:

1. Meet the admission requirements of graduate education at West Virginia University.
2. Have completed a baccalaureate program in nursing which is accredited by the National League for Nursing (NLN). Applicants with a baccalaureate degree from nursing programs without NLN accreditation are required to take the NLN Comprehensive Achievement Test for Baccalaureate Nursing Students, Form 3113, and are considered on an individual basis.
3. Have completed a course in introductory statistics (three credit hours).

4. Provide the following:
 - a. Statement of philosophy of nursing and professional goals.
 - b. Letter of recommendation from each of the following: head of undergraduate nursing program, employer, and a colleague.
 - c. Evidence of a current professional nursing license in at least one state.

5. Have an interview with a Graduate Academic Unit faculty member.

Three parameters are used for review of applicants: academic achievement, career goals, and recommendations. Once admitted, the student is assigned a faculty adviser who guides the student in curricular and academic matters. Enrollment in nursing courses is based upon readiness, availability of space and other essential resources.

The application process must be completed by January 1 for summer (May) enrollment; March 1 and August 1 for fall and spring enrollment, respectively. Class sizes are limited, based on available faculty resources and space.

Application Process

Applicants need to complete two application forms as indicated and return to the appropriate offices to avoid unnecessary delay in the review process.

- a. Application for admission to graduate studies—To be returned with a \$20.00 nonrefundable service fee to: Office of Admissions and Records, West Virginia University, P.O. Box 6009, Morgantown, WV 26506-6009.
- b. Application for admission to the master of science in nursing program—To be returned to: Chairperson, Graduate Academic Unit, WVU School of Nursing, Morgantown, WV 26506.

1. Request an official transcript of records from each college or university previously attended. Transcripts and records should be sent directly to the WVU Office of Admissions and Records.
2. Send three recommendation letters directly to the chairperson of the School of Nursing graduate academic unit.
3. Participate in an interview with a faculty member teaching in the graduate program. The purpose of the interview is to verify application materials, review admission criteria, identify deficiencies and transferable credits and, where possible, project a tentative plan of study.

Degree Requirements

1. Completion of 42 semester credit hours, including 30 hours (master's paper option) to 33 hours (thesis option) in nursing and nine hours of non-nursing electives. The required non-nursing electives are restricted to three hours in computer utilization and six hours of humanities and/or social sciences. Students opting for a master's paper must complete an additional three hours of electives by advisement.
2. Completion of a thesis (six hours) or a master's paper (three hours).
3. Achievement of an overall academic average of at least B in all work attempted in the master's program. The grade C in two nursing courses will require a faculty review of the student's program progression.
4. Removal of all conditions, deficiencies, and incomplete grades. Credit hours for courses in which the grade is lower than C will not count toward satisfying graduate degree requirements.

Required courses must be taken for letter grades (A, B, C). Electives may be opted for satisfactory (S) or unsatisfactory (U) grades—subject to the approval of the adviser.

M.S.N. Curriculum

<i>Nursing Theory, Practice, and Research (30-33 hours)</i>	<i>Hr.</i>
Nsg. 300—Advanced Nursing: Primary Health Care 1	3
Nsg. 301—Advanced Nursing: Primary Health Care 2	3
Nsg. 302—Advanced Nursing: Primary Health Care 3	3
Nsg. 310—Advanced Nursing Practice 1	3
Nsg. 311—Advanced Nursing Practice 2	3
Nsg. 312—Advanced Nursing Practice 3	3
Nsg. 370—Theories in Nursing	3
Nsg. 373—Research Process and Methods in Nursing	3
Nsg. 400—Advanced Nursing Practice 4	3
Nsg. 497—Research (master's paper/thesis)*.....	<u>3-6</u>
	30-33

*Students electing the master's paper option are required to take only three hours of Nursing 497.

Electives (9-12 hours)

Master's paper option:

Cognates (Non-Nursing).....	9
Electives by Advisement	3

Thesis option:

Cognates (Non-Nursing).....	9
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TOTAL..... 42-45

Sample Progression Plan (Full-time Study)

Semester I	Hr.	Semester II	Hr.	Semester III	Hr.	Semester IV	Hr.
Nsg. 300	3	Nsg. 301	3	Nsg. 302	3	Nsg. 400	3
Nsg. 310	3	Nsg. 311	3	Nsg. 312	3	Nsg. 497	3
Nsg. 370	3	Nsg. 373	3	Nsg. 497	3	Elective	3
	—	Elective	—	Elective	—		—
	9		12		12		9

Nursing (Nsg.)

300. Advanced Nursing: Primary Health Care 1. I, II, S. 3 hr. PR or Conc.: Nsg. 370. Analysis and synthesis of concepts in nursing and related sciences relevant to the development of a conceptual framework for nursing in primary health care. (Emphasis on individual system.)
301. Advanced Nursing: Primary Health Care 2. I, II, S. 3 hr. PR: Nsg. 310; PR or Conc.: Nsg. 373. Development of a conceptual model for nursing with emphasis on developing strategies to promote client health. (Emphasis on family system.)
302. Advanced Nursing: Primary Health Care 3. I, II, S. 3 hr. PR: Nsg. 311. Further development and or refinement of a conceptual model for nursing with specific emphasis on planned change strategies and how these strategies impact health. (Emphasis on community system.)
310. Advanced Nursing Practice 1. I. 3 hr. Conc.: Nsg. 300. Advanced nursing practice focusing on applicability of concepts in students' developing conceptual framework. (Emphasis on individual system.)

311. Advanced Nursing Practice 2. II. 3 hr. Conc.: sg. 301. Advanced nursing practice focusing on development and application of nursing strategies within the context of students' conceptual model. (Emphasis on family system.)

312. Advanced Nursing Practice 3. I, S. 3 hr. Conc.: Nsg. 302. Advanced nursing practice focusing on application and testing of students' conceptual model, identification of a health problem area within the practice setting, and preparation of a planned change strategy. (Emphasis on community system.)

370. *Theories in Nursing.* I, S. 3 hr. PR: Graduate standing; consent. Introduction to the structure and function of extant theories in nursing as a basis for developing a conceptual framework for nursing.

373. *Research Process and Methods in Nursing.* II. 3 hr. PR: Nsg. 310, 370. Study of the research process and methods for incorporation into students' conceptual model, practice and research in nursing.

400. Advanced Nursing Practice 4. I, II. 3 hr. PR: Nsg. 312. Collaborative practice focusing on the evaluation and modification of students' conceptual model for nursing and implementation of a planned change strategy. (Emphasis on role synthesis.)

491. Advanced Study. I, II. 1-3 hr. PR: Graduate standing; consent. In-depth study of topics related to current issues in primary health care. Study may be independent or through specially scheduled seminars.

497. A. Research. 3 hr. PR: Nsg. 373; PR or Conc.: Nsg. 312; consent. Refinement and implementation of research proposal to meet requirements for the master's thesis, or completion of the master's paper.

497. B. Research. 1-3 hr. PR: Nsg. 497. Completion of master's thesis.

OCCUPATIONAL HEALTH AND SAFETY ENGINEERING

Terrence J. Stobbe, Coordinator of the Program

Warren Myers, Assistant Coordinator 529 Engineering Sciences Building

Degree Offered: Master of Science

Graduate Faculty: Members Myers, Plummer and Stobbe.

Master of Science (M.S.)

This program provides master-level students the opportunity to study industrial hygiene and systems safety. This degree is designed for students who are interested in pursuing a career in occupational safety and health.

Students are admitted as regular graduate students for work leading to the Master of Science (M.S.) degree, provided they hold a baccalaureate degree from an approved institution of higher education in the areas of biology, chemistry, engineering, mathematics, or physics, have a minimum 2.5 undergraduate grade-point average, and satisfy prerequisites in the courses for which they register. In order to receive the degree, the student must have a minimum 3.0 grade-point average in all course work leading to the degree and satisfy all general WVU graduate requirements.

The following courses are prerequisite or corequisite, depending on the applicant's academic and professional experience: statistics (Stat. 311, I.E. 113 or equivalent); chemistry (Chem. 15 and 16 or equivalent); computer programming (C.S. 5 or equivalent); physics (Phys. 11 and 12 or equivalent); mathematics (Math. 15 and 16 or equivalent). Pre- and corequisite coursework decisions are made on a case-by-case basis by the program admissions

committee; the student is informed about his/her requirements at the time of acceptance into the program.

Admission to candidacy for the M.S. degree is required before obtaining the degree. A graduate student may apply for admission to candidacy by formal application after completing a minimum of 12 hours of graduate courses within the program with a grade-point average of at least 3.0 based on all graduate courses taken in residence, for which the student has received a grade at the time of application. Admission must be gained before completion of 18 hours.

A minimum of 36 hours is required for the Master of Science degree.

A writing requirement is an integral part of the master's program. This requirement can be satisfied with either a three credit-hour problem report, which is based on some research, or a six credit-hour thesis.

Course credit for all of the above is applicable against the 36-hour requirement.

Program of Study

FALL

- I.E. 260—Human Factors Engineering*
- I.E. 261—Systems Safety Engineering*
- I.E. 361—Industrial Hygiene Engineering*
- I.E. 480—Seminar—Fire Protection Engineering*
- C.E. 245—Properties of Air Pollutants**
- Seminar (required)

*Required courses for both industrial hygiene and systems safety students.

**Required course for industrial hygiene students only.

SPRING

- OHSE 321—Epidemiology: Principles and Practices*
- OHSE 325—Industrial Hygiene Sampling and Analysis*
- I.E. 362—Systems Safety Engineering 2***
- Pcol. 362—Occupational Toxicology*
- I.E. 364—Industrial Ergonomics*
- Seminar (required)

SUMMER

- OHSE 328—Noise and Ventilation Control Technology*
- OHSE 326—Safety and Health Measurement and Instrumentation*

*Required courses for both industrial hygiene and systems safety students.

**Required course for industrial hygiene students only.

***Required course for systems safety.

Electives

Industrial hygiene and systems safety have a minimum of 4 elective hours each.

Occupational Health and Safety Engineering

Ch.E. 290, 390, 391.

Chem. 210.

C.E. 251, 349, 350, 359, several additional 400-level courses qualify if students possess prerequisites.

E.M. 201, 213, 216, 247.

I.E. 214, 249, 314, 325, 341, 360, 368.

Manag. 216.

M.A.E. 242, 282, 330.

Phys. 201.

Psych. 225, 232, 301.

Saf. S. 301, 334, 418.

Stat. 312.

Occupational Health and Safety Engineering (OHSE)

320. *Foundations of Environmental Health Practice.* I, II, S. 4 hr. PR: Consent. Designed to enable the environmentalist to recognize and identify environmental stresses and the effect of these stresses on man. Topics include occupational health, physical stress, safety, and basic and broad principles of toxicology.

321. *Epidemiology: Principles and Practices.* I, II, S. 2 hr. PR: Stat. 311 or equiv. Principles and methods of epidemiology with emphasis on descriptive and analytical epidemiological methods.

325. *Industrial Hygiene Sampling and Analysis.* II. 3 hr. PR: I.E. 361 and consent. Calibration and use of sampling and analytical equipment used by industrial hygienists to evaluate the work environment. Advantages and disadvantages of different equipment under various conditions. Biological monitoring as an evaluation tool.

326. *Safety and Health Measurement and Instrumentation.* S. 3 hr. PR: Consent. Practical experience in setting up industrial hygiene field studies, air sampling, and analysis. Practical experience with safety equipment and instrumentation used in the field and in research. Field trips and case studies exposing students to a variety of industrial processes.

328. *Noise and Ventilation Control Technology.* S. 3 hr. PR: I.E. 361 or consent. The course will demonstrate techniques for the recognition, evaluation, and control of noise and ventilation problems. Students will use monitoring equipment to evaluate situations and perform several design projects.

380. *Internship.* I, II, S. 3-6 hr. (May be repeated.) PR: Consent of committee chairperson and department chairperson. Professional internship providing on-the-job training under supervision of a previously approved environmentalist in settings appropriate to professional objectives.

ORTHODONTICS

Harry L. Legan, Chairperson of the Department

1077 Health Sciences Center North

Degree Offered: Master of Science

Graduate Faculty: Members Legan, McCutcheon, Overman, Paonaskar, and Staggers.

Master of Science

The School of Dentistry and its Department of Orthodontics offer a program of advanced study and clinical training leading to the degree of master of science (M.S.). The program requires a minimum of 34 months (three academic years and two summers) of full-time residency in the School of Dentistry, and is designed to qualify dentists for careers in orthodontic clinical practice, teaching, and research.

Inquiries concerning this program should be directed to the Office of the Associate Dean for Postdoctoral Programs. Those applicants approved for admission to the program will be notified soon after December 1.

Requirements for Admission to the Orthodontic Program

1. Graduation from an accredited dental school.
2. Evidence of scholastic and clinical achievement that would indicate the applicant's ability to progress in a program of this nature. Generally, a minimum grade-point average of 3.00 is required for admission.
3. Each applicant must file with the department all information requested in the department application form.

Requirements for Master of Science Degree

1. Fulfillment of WVU general requirements for graduate study.
2. Thirty-four months (three academic years and two summers) of consecutive residency at the School of Dentistry.
3. An approved master's thesis based on original research completed during the period of residency in an area related to orthodontics.
4. Must satisfactorily pass a final oral examination.
5. Must complete a minimum of 60 credit hours. These include 35 hours of orthodontic courses, a minimum of nine hours of selected basic sciences subjects, a minimum of six hours of elective allied subjects, and a thesis (six hours).
6. Must have demonstrated satisfactory clinical competence in the student's field.
7. Must have maintained a grade level commensurate with graduate education.

Anatomy (Anat.)

315. *Advanced Applied Anatomy.* I. 3 hr. PR: Consent. Advanced descriptive and functional anatomy of the head and neck, especially as it relates to orthodontics. The course stresses the oral-facial region, the skullbase, and the architecture of the skull in relation to masticatory forces.
316. *Craniofacial Growth and Maturation.* II. 3 hr. PR: Anat. 315 or consent. The current concepts of craniofacial growth and maturation are presented and integrated for application to clinical problems.

Orthodontics (Dent.)

416. *Biomechanics.* I, II, S. 2 hr. PR: Consent. Design and function of the teeth and their surrounding structures, and response of these tissues to orthodontic procedures.
417. *Orthodontic Technique.* I, II, S. 2 hr. PR: Consent. Laboratory course in techniques related to fabrication and manipulation of orthodontic appliances.
418. *Orthodontic Materials.* I, II, S. 1 hr. PR: Consent. Physical properties of materials used in orthodontic appliances.
419. *Orthodontic Diagnosis.* I, II, S. 1-3 hr. PR: Consent. Seminar-type class on technique of patient examination, acquiring diagnostic records, and analyzing and correlating this information to the treatment of clinical problems.
420. *Cephalometrics.* S. 1-3 hr. PR: Consent. Use of radiographic cephalometry in studying growth of the human face, analysis of dentofacial malformations, and evaluation of orthodontic treatment.
421. *Orthodontic Mechanics.* I, II, S. 1-4 hr. PR: Dent. 416, 417. Seminar and laboratory course on basic orthodontic mechanical properties.
422. *Advanced Orthodontic Mechanics.* I, II, S. 1 hr. PR: Dent. 421. Continuation of Dent. 421 involving more difficult type cases and introducing more sophisticated appliance therapy.
423. *Growth and Development.* II. 1-5 hr. PR: Consent. Seminar-type course on normal and abnormal growth of the human head and its application to orthodontics.
425. *Orthodontic Seminar.* I, II, S. 1-8 hr. PR: Consent. Discussions involving all branches of dental science, with special emphasis on the orthodontic interest. Assigned topics and articles in the literature discussed.
426. *Orthodontic Clinic.* I, II, S. 1-12 hr. PR: Dent. 416, 417. Clinical treatment of selected patients.
497. *Research.* I, II, S. 1-15 hr.

Pathology (Path.)

397. *Pediatric Oral Pathology.* I. 2 hr. PR: Consent. Lecture and seminar course on inherited diseases and other pathologic situations of oral cavity and face specific for pediatric age group.

Statistics (Stat.)

311. *Statistical Methods 1.* I, II. 3 hr. PR: Math 3. Statistical models, distributions, probability, random variables, tests of hypotheses, confidence intervals, regression, correlation, transformations, F and Chi-square distributions, analysis of variance and multiple comparisons. (Equiv. to Ed. P. 311 and Psych. 311.)

PETROLEUM ENGINEERING

Samuel Ameri, Chairperson of the Department

347A COMER Building

Degree Offered: Master of Science in Petroleum Engineering

Graduate Faculty: Members Ameri, Aminian, Wasson, and Yu.

Master of Science in Petroleum Engineering (M.S.Pet.E.)

A student desiring to take courses for graduate credit at the master's level in the College of Mineral and Energy Resources must first apply for admission and state the major field.

An applicant with a baccalaureate degree, or its equivalent in petroleum or natural gas engineering, will be admitted on the same basis as graduates of WVU. Lacking these qualifications, the applicant must first fulfill the College of Mineral and Energy Resources requirements of the Department of Petroleum and Natural Gas Engineering.

Academic Standards. Each student will, with the approval of the student's graduate committee—appointed with the consent of the student within the first semester of registration—follow a planned program. The program contains a minimum of 24 hours of course work and six hours of independent and original study in the petroleum and natural gas engineering field leading to a master's thesis or 30 hours of course work and three hours of independent study leading to a comprehensive problem report. At least 60 percent of the course credits must be from 300-level or 400-level courses while the remainder can be made up of 200-level courses.

Approval for candidacy for a graduate degree by faculty action is required to establish eligibility for a degree. A graduate student may request approval by formal application after completing a minimum of 12 semester hours of graduate courses with a grade-point average of at least 3.0 (B), based on all graduate courses in residence for which final grades have been recorded.

No credits are acceptable toward an advanced degree which are reported with a grade lower than C. To qualify for an advanced degree, a graduate student must have a grade-point average of at least 3.0 based on all courses completed in residence for graduate credit. Each candidate for a degree must select a major subject and submit a thesis showing independent, original study in petroleum engineering.

Each degree candidate is required to take Pet.E. 496.

Petroleum Engineering (Pet.E.)

207. *Natural Gas Engineering.* I. 4 hr. PR: Pet.E. 233, M.A.E. 101, 114, Math. 18. Natural gas properties, compression, transmission, processing, and application of reservoir engineering principles to predict the performance and design of gas, gas-condensate, and storage reservoirs. Includes a laboratory devoted to gas measurements. 3 hr. lec.; 3 hr. lab.

208. *Natural Gas Production and Storage*. II. 3 hr. PR: Pet.E. 207, 234 or consent. Development of gas and gas-condensate reservoirs; design and development of gas storage fields in depleted gas, gas-condensate, oil reservoirs and aquifers; design of natural gas production and processing equipment.

210. *Drilling Engineering*. II. 4 hr. PR or Conc.: Geol. 1, M.A.E. 114. Rock properties, functions and design considerations of rotating system, hoisting system, and circulation system; drilling fluids calculations and selections; hydraulic programs; drilling optimization; casing and casing string design; cementing programs; and pressure control.

211. *Production Engineering*. I. 3 hr. PR: Pet.E. 210. Well completion, performance of productive formation, drill stem tests, completion of wells, flowing wells, gas lift methods and equipment, pumping installation design, well stimulation, emulsion, treating, gathering and storage of oil and gas, field automation. 3 hr lec.

212. *Drilling Fluids Laboratory*. I, II. 1 hr. PR or Conc.: Pet.E. 210, Chem. 141, M.A.E. 114. Topics include clay hydration, viscosity of water-based fluids, mud weight control, filtration studies, thinning agents, chemical contaminants, lime muds, polymer muds, rheological models, and liquid and solid determination.

215. *Transport Phenomena in Petroleum Engineering*. II. 3 hr. PR: M.A.E. 41. Introduction to fluid flow in pipes, two-phase flow, rotary drilling hydraulics, primary cementing jobs, flow calculations, flow measuring devices, fluid machinery, dimensional analysis, and heat transfer.

216. *Petroleum Engineering Design*. I, II. 3 hr. PR: Pet.E. 234 or consent. Comprehensive problems in design involving systems in oil and gas production, field processing, transportation, and storage. Three 3-hr. labs.

224. *Petroleum Engineering Problems*. I, II, S. 3 hr. PR: Senior standing. Investigation and detailed report on a special problem in petroleum engineering. Supervised by a member of the Petroleum Engineering faculty. A final oral examination is required.

233. *Elements of Petroleum Reservoir Engineering*. II. 3 hr. PR: Pet.E. 236 or consent. Basic properties of petroleum reservoir rocks. Fluid flow through porous materials. Evaluation of oil and gas reserves. 3 hr. lec.

234. *Applied Petroleum Reservoir Engineering*. I. 3 hr. PR: Pet.E. 233 or consent. Application of reservoir engineering data to calculation of recovery potentials and to analysis, simulation, and prediction of reservoir performance under a variety of production methods to effect maximum conservation. 3 hr. lec.

235. *Formation Evaluation*. I, II. 3 hr. PR: Pet.E. 210 or consent. Various well logging methods and related calculations with exercises in interpretation of data from actual well logs. 3 hr. lec.

236. *Petroleum Properties and Phase Behavior*. I, II. 3 hr. PR or Conc.: Chem. 141. Theoretical and applied phase behavior of hydrocarbon systems and hydrocarbon fluid properties. Applications to petroleum reservoir and production engineering design. 2 hr. lec., 3 hr. lab.

241. *Oil and Gas Property Evaluation*. I. 3 hr. PR: Pet.E. 235; Coreq. Pet.E. 211 and 234, or consent. Reserve estimation, decline analysis, petroleum properties evaluation including interest calculations, costs estimation, and taxes evaluation. Overview investment decision analysis and computer applications in properties evaluation.

244. *Petroleum Reservoir Engineering Laboratory*. I, II. 1 hr. PR or Conc.: Pet.E. 233. Laboratory evaluation of basic and special petroleum reservoir rock properties. 3 hr. lab.

262. *Introduction to Reservoir Simulation*. I. 3 hr. PR: M. 281, Pet.E. 234 or consent. Partial differential equations for fluid flow in porous media and the use of finite-difference equations in solving reservoir flow problems for various boundary conditions. Study of individual well pressures and fundamentals of history matching.

299. *Well Stimulation Design.* II. 3 hr. PR: M.A.E. 43, Pet.E. 210, 233, 235. (Field trips required.) Fundamentals of well stimulation, treatment design and their applications to low permeability formations.

302. *Fluid Flow in Porous Media.* I. 3 hr. PR: Pet.E. 234, Math. 18 or consent. Theoretical and practical aspects of the physical principles of hydrodynamics in porous media. 3 hr. lec.

340. *Secondary Recovery of Oil by Water Flooding.* I. 3 hr. PR: Pet.E. 233. Theory of immiscible fluid displacement mechanism, evaluation and economics of water flood projects, and oil field flooding techniques. 3 hr. lec.

343. *Advanced Secondary Recovery.* II. 3 hr. PR: Pet.E. 340. Secondary recovery of oil by gas flooding, miscible fluid injection, *in situ* combustion, and heat injection. 3 hr. lec.

362. *Reservoir Simulation and Modeling.* II. 3 hr. PR: Pet.E. 262 or consent. Application of finite-difference equations to multi-phase fluid flow in porous media in two or three dimensions with gravity and capillary pressure effects. Simulation of water-flood performance and enhanced recovery techniques.

384. *Pressure Transient Analysis.* II. 3 hr. PR: Pet.E. 234 or consent. Methods of analysis of pressure transient data obtained from well testing for the purpose of determining *in-situ* reservoir conditions including porosity, lateral extent, average reservoir pressure, and formation permeability.

394. *Special Topics.* I, II, S. 1-6 hr. PR: Consent. Selected fields of study in petroleum and natural gas engineering.

397. *Master's Degree Research or Thesis.* I, II, S. 1-15 hr. PR: Consent. Research activities leading to a thesis, problem report, research paper, or equivalent scholarly project.

496. *Graduate Seminar.* I. 1 hr. PR: Consent. Individual study and oral presentation of selected topics in petroleum engineering. Current petroleum literature and research are discussed.

497. *Research.* I, II, S. 1-15 hr.4

General Minerals Program (M.)

281. *Applied Mineral Computer Methods.* I, II. 3 hr. PR: M. 2; Math. 16. Problem solving in mineral processing, mineral resources, mining, and petroleum and natural gas engineering. Emphasis on applications using various computing technologies.

PHARMACEUTICAL SCIENCES

James K. Lim, Interim Coordinator of Graduate Pharmaceutical Sciences Studies
1136 Health Sciences Center

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Abate, Brister, Brushwood, Elliott, Gannett, Glover, Griffith, Higa, Howard, Jacknowitz, Khoury, Kirsch, Lalka, Lim, Ma, Madhavan, Makela, Malanga, Nematollahi, Noonan, O'Connell, O'Donnell, Ponte, Riley, Rojanasakul, Rosenbluth, Shah, Stevenson, Stout, and Wedin.

The School of Pharmacy offers graduate programs in the basic pharmaceutical sciences and in administrative pharmacy, leading to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) These research-oriented curricula and programs are sufficiently flexible to accommodate individual interests, capabilities, and potential of the student for maximum academic development in becoming competent researchers and teachers.

For general admission, applicants must satisfy the requirements for all graduate students entering WVU. For admission with regular student status, the applicant must possess a baccalaureate degree from a suitable area of study, an overall grade-point average of at least 2.75, and an aptitude and interest for graduate work in the pharmaceutical sciences. Applicants not admitted with regular student status may be considered for alternate admission status, as explained in Part 2 of this catalog. Graduate Record Examination scores in the verbal, quantitative, and analytical portions of the examination are required of all students, and TOEFL, or similar scores, are additionally required of international applicants. For applicants in the area of behavioral and administrative pharmacy, test scores on the Graduate Management Admissions Test (GMAT) are acceptable, although GRE scores are preferred.

Academic Standards

No course credits with a grade of less than C may be counted toward fulfilling credit-hour requirements for a graduate degree. Furthermore, a cumulative grade-point average of no less than 3.0 in all graduate courses must be obtained by the student to qualify for an advanced degree.

Master of Science (M.S.)

Students admitted for the Master of Science (M.S.) may specialize in pharmacy administration, pharmacology and toxicology, pharmacognosy, pharmaceutical chemistry, industrial pharmacy, medicinal chemistry, pharmaceuticals, biopharmaceutics, and pharmacokinetics.

Requirements for M.S. Degree

To be eligible for the M.S. degree, students must complete a minimum of 30 hours of graduate credit, of which no more than six hours may be for research and thesis.

Upon completion of course work and research requirements, and after submission of the thesis, an oral examination for the thesis defense will be administered by the student's advisory committee.

Doctor of Philosophy (Ph.D.)

Students admitted for the Doctor of Philosophy (Ph.D.) degree program may choose among several specialty areas, which include medicinal chemistry, pharmaceuticals/biopharmaceutics/pharmacokinetics, and behavioral and administrative pharmacy.

Requirements for Ph.D. Degree

The student's first semester is usually occupied with course work while under the guidance of an interim advisory committee. During this period, a student will confer with faculty members in the student's area of interest concerning a possible research project, and a major professor should be chosen by the end of the first semester of graduate study. The student's research committee (minimum of five for Ph.D., or three for M.S.) should be formed by the end of the second semester of graduate study, occurring usually at the completion of 18-20 hours of graduate course work. Any interest to pursue the M.S. degree en route to the Ph.D. should also be stated at this time. Students must complete all requirements for the M.S. degree except the preparation and defense of the thesis in order to advance in the Ph.D. program.

The student, however, may with committee advice, elect to prepare and defend a thesis for first obtaining the M.S. before the Ph.D.

A formal study and research plan must be submitted by the student upon completion of 35 credit-hours (or 24 credit-hours for the M.S.) of formal graduate course work. With guidance from the research advisory committee and by the end of the second year in the program, the student should have completed the language/research tool requirements.

To be admitted for candidacy of the Ph.D. degree, the student must satisfy the above requirements and pass oral and written qualifying examinations. After admission to candidacy for the Ph.D., a student normally devotes substantial time to work on an original research project, which culminates in a dissertation. The dissertation must be satisfactorily completed and defended at an oral examination before the recommendation for the awarding of the Ph.D. degree.

Pharmaceutical Chemistry (Ph. Ch.)

375. *Advanced Pharmaceutical Analysis. I or II. 3 hr.* Spectroscopic methods of analysis with emphasis on their applications in pharmaceutical problems and in biological sciences.

376. *Advanced Pharmaceutical Analysis. I or II. 3 hr.* Continuation of Ph. Ch. 375, with emphasis on electro-analytical methods and preparation of samples from pharmaceutical dosage forms and from biological materials.

377. *Advanced Pharmaceutical Analysis. I or II. 3 hr.* Physical-chemical principles involved in methods development. A special problem is assigned as an integral part of the course.

Pharmacognosy (Pcog.)

340. *Organic Plant Constituents. I or II. 3 hr.* Occurrence, properties, biogenesis, etc. of a number of classes of organic compounds derived from plants. Emphasis on secondary metabolites which contain products of pharmaceutical or medicinal interest.

341. *Isolation of Plant Constituents. I or II. 3-5 hr.* Acquaints the student with techniques used in extraction, separation, and isolation of plant constituents.

Pharmacy (Phar.)

300. *Industrial Pharmacy. I. 4 hr.* Major aspects and principles of dosage form development and manufacture. Structure of industry and government influences. Laboratory experiences in manufacturing and development techniques.

301. *Advanced Biopharmaceutics. I or II. 3 hr.* Concepts of biopharmaceutics and pharmacokinetics in relation to the design and evaluation of dosage forms and determination of rational dosage regimens in health and disease.

314. *Cosmetic Formulation. II. 3 hr. PR: Phar. 203.* Introduction to principles and basic considerations of cosmetic formulations, including review of anatomy/physiology of skin. Laboratory exposes students to practical aspects of processing the more popular cosmetic products.

315. *Physical Pharmacy. I or II. 3 hr.* Designed to illustrate the special application of physicochemical properties of materials to pharmaceutical and physiological systems. Especially useful in delineating formulation considerations impinging upon the stability of complex systems.

370. *The Synthesis of Drugs.* I, II, S. 3 hr. PR: Chem. 332 and consent. A survey of the approaches employed in the synthesis of a variety of examples of pharmacologically useful agents. Emphasis is placed on retrosynthetic analysis of target molecules and the application of synthetic procedures to multi-step synthesis.

390. *Special Topics.* I, II, S. 1-4 hr.

391. *Seminar in Pharmaceutical Sciences.* I, II. 1 hr. PR: Consent. A multidisciplinary weekly presentation and discussion of special topics and research in the pharmaceutical sciences. (Weekly attendance is required and grading is on an S/U basis only.)

396. *Special Problems in Pharmaceutical Sciences.* I, II, S. 1-3 hr. Where special interest is shown by the student in an area other than of the student's thesis research, a faculty member will supervise individual study and research.

484. *Special Seminar.* I, II, S. 1-6 hr. For use by disciplines in the pharmaceutical sciences wishing to have graduate students and faculty participate in seminars and group discussion on specialized or technical topics at the advanced level.

490. *Teaching Practicum.* I, II. 1-3 hr. PR: Graduate standing and consent. Supervised practices in college teaching of pharmacy.

491. *Advanced Study.* I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

496. *Graduate Seminar.* I, II. 1 hr. PR: Consent. Formal presentation by graduate students to assembled graduate faculty and students of research or special topics approved by adviser. Title to be presented at start of semester. Required at least once annually. (Grading is S/U.)

497. *Research.* I, II, S. 1-15 hr.

498. *Thesis.* I, II, S. 2-4 hr. PR: Consent.

Pharmacy Administration (Phar. Ad.)

320. *Drug Regulation and Control.* I or II. 3 hr. Legislation affecting the development, introduction, control, and utilization of drugs in the American economy.

321. *Drug Distribution Systems.* I or II. 3 hr. Detailed study and analysis of drug distribution in institutional environments.

323. *Economics of the Pharmaceutical Industry.* I or II. 3 hr. History, background, and formation of major drug industries, Oligopolistic practices, mergers, combines, costs of research, and production.

Pharmaceutics (Pceut.)

302. *Advanced Pharmaceutics.* I or II. 3 hr. Physiochemical and biopharmaceutical principles involved in disperse systems (liquid, semi-solid, and solid) which function as dosage forms. Considerations of properties of solid dispersions, micromeritics, diffusion of liquid dispersions, interfacial phenomena, emulsification, suspensions, prolonged action medication, etc.

PHARMACOLOGY AND TOXICOLOGY

William W. Fleming, *Chairperson of the Department*

3151 Health Sciences North

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Azzaro, Birkle, Colasanti, Craig, Davis, Fedan, Fleming, Houser, Mawhinney, Reasor, Smith, Stitzel, Strobl, Taylor, Van Dyke, Weber, and Worley.

Pharmacology and toxicology involve all aspects of the action of drugs on living systems and their constituent parts. These range from the chemical reactions taking place within cells to the evaluation of a drug in the treatment of human disease. The Department of Pharmacology and Toxicology offers graduate studies leading to the degrees of Master of Science and Doctor of Philosophy, with research concentrations in such areas as autonomic pharmacology, biochemical pharmacology, neuropharmacology, molecular pharmacology, cardiovascular pharmacology, endocrine pharmacology, malarial chemotherapy, and molecular, renal, hepatic, and pulmonary toxicology.

Admission Requirements

Regular applicants for the graduate program in pharmacology and toxicology should present, as a minimum, the following undergraduate courses: one semester of biology; two semesters of physics; one semester of calculus; four semesters of chemistry including two semesters of organic chemistry. Two letters of recommendation from science professors, an official transcript, and the results of the Graduate Record Examination are also required. The prospective student should have a minimum 3.0 overall grade-point average at the undergraduate level.

In general, students requesting financial support should have all credentials forwarded by February 1. For additional information write to the Director of Graduate Studies, Department of Pharmacology and Toxicology, WVU Health Sciences Center, Morgantown, WV 26506.

Master of Science

Ordinarily the department does not accept graduate students solely into a master's program. However, the master's degree is offered and is available as an intermediate degree en route to the Ph.D. Its primary function, as viewed by the faculty, is as an aid to the student new to research for the formulation, conduct, and writing of an abbreviated, but complete, independent research project. The course work requirements for the M.S. in pharmacology and toxicology usually consist of Physiology 344 and 345, Biochemistry 231, Statistics 311, Pharmacology and Toxicology 361, 364, 461, 462, and 497. Most students, with the faculty's concurrence, choose to proceed directly with their doctoral research without a master's degree. These students must submit a comprehensive progress report on their research in lieu of a thesis.

Doctor of Philosophy

Before official admission to candidacy for the doctorate, the student must satisfactorily complete a grant-writing exercise, an acceptable progress report, and an oral comprehensive qualifying examination.

A doctoral examining committee will be formed at the time of submission of the grant proposal (at the beginning of the third year in the program). The committee will generally consist of at least three members from within the

Department of Pharmacology and Toxicology and two from outside the department. Before any doctoral committee is appointed, its membership must be approved by the department faculty. The committee will then meet with the student to approve the grant-writing exercise and to discuss the details of the proposed dissertation research. Regardless of whether the student takes an M.S. or elects to do a progress report, he/she and the committee must agree on the final plan for the dissertation research. The committee is to be informed if major changes in the plan are contemplated and will meet periodically with the student to discuss his/her progress. Three or four months before the completion of the research project, the committee will again meet with the student to decide specific details of the dissertation preparation.

The oral preliminary examination will be held in early January of the student's third year in the program. The scheduling of the preliminary examination is contingent upon successful completion of all work to that date, including a satisfactory grant application. The student's doctoral committee will constitute the oral examining body.

If the student successfully passes the oral examination, a progress report should be submitted to his/her dissertation committee on or about March 1 of the third year.

If a student is not successful in the oral preliminary examination, the committee may recommend a second attempt to take place not less than one nor more than three months later. Alternatively, the committee may recommend to the entire faculty that the student should write a master's thesis.

A progress report is expected to be written by each student in the program, except those students who are receiving an M.S. degree. M.S. students will write a master's thesis. The progress report should be written in the style of a dissertation and should be presented in an acceptable form to the dissertation committee on or about March 1 of the student's third year in the program. The student will defend the progress report before the dissertation committee.

Dissertation

Upon admission to candidacy for the degree of Doctor of Philosophy, the candidate must select a topic for the dissertation under the direction of the candidate's adviser, complete a dissertation which makes a contribution to knowledge in the candidate's area of concentration, and pass an oral examination based primarily upon the dissertation. After successful completion of the oral examination and submission of the final copy of the dissertation, the candidate will be recommended for the degree.

Research and Instruction

Autonomic pharmacology: autonomic regulation of the cardiovascular system and of smooth muscle; sensitivity to autonomic drugs; electrophysiological studies of cardiac and smooth muscle.

Chemotherapy: antimalarial agents, anticancer agents, effects of pharmaceutical agents on single-cell organisms.

Biochemical pharmacology: drug metabolism, effects of drugs on lipid and nucleic acid metabolism.

Molecular pharmacology: interaction of drugs and hormones with nucleic acids.

Endocrine pharmacology: mechanism of action of steroids, metabolism of sex accessory tissues, relationship of hormones to tumor growth and development.

Neuropharmacology: biochemical basis of epilepsy, mechanism of action of anticonvulsant drugs, neuromediators in the central nervous system.

Toxicology: metabolism of toxic agents, pulmonary toxicology, renal toxicology, immunotoxicology, environmental toxicology, and perinatal pharmacology and toxicology.

Pharmacology and Toxicology (Pcol.)

243. *Pharmacology for Pharmacy Students.* I. 4 hr. PR: Completion of first year in Pharmacy; approval of course director. Principles, pharmacodynamic actions, and therapeutic applications of clinically useful drugs.

360. *Pharmacology and Therapeutics.* (For dental and graduate students.) I. 4 hr. PR: Dental student standing or consent. Lecture and demonstrations on pharmacological actions and therapeutic uses of drugs.

361. *Pharmacology.* (For medical students and a limited number of regular, full-time graduate students in basic medical science departments.) II. 6 hr. PR: Consent of department chairperson. Lecture-conference-laboratory on principles, pharmacodynamic actions, and therapeutic applications of clinically useful drugs.

362. *Occupational Toxicology.* II. 3 hr. PR: Consent. General principles of toxicology with special emphasis on occupational health. Classes of chemicals which pose problems in the workplace will be emphasized.

363. *Toxicology.* I. 3-4 hr. (Variable credit; majors enroll for 4 hr., non-majors for 3 hr.) PR: Consent. Theoretical concepts and general principles of toxicology with special emphasis on molecular mechanisms of toxicity. 3-4 hr. lec. (Offered alternate even years.)

364. *Advanced Pharmacology.* 1-6 hr. PR: Pcol. 361 or consent. Advanced lectures and discussion in three parts: 1. Advanced Basic Principles of Pharmacology, 2. Advanced Cellular Pharmacology, and 3. Advanced Toxicology. (Offered every second year.)

367. *Advanced Neuropharmacology.* 1-6 hr. PR: Pcol. 361 or consent. Advanced lectures and discussion in three parts: 1. Receptors and Signal Transduction, 2. Neurochemistry-Neurotransmitters, and 3. Advanced Neurosystems. (Offered every second year.)

461. *Seminar in Pharmacology.* I, II. 1 hr. per sem. PR: Pcol. 361 or graduate status in basic medical sciences.

462. *Literature Survey.* I, II. 1 hr. per sem. PR: Graduate status in pharmacology and toxicology. Current literature pertinent to pharmacology and toxicology including journals of allied biological sciences.

490. *Teaching Practicum.* I, II. 1-3 hr. per sem. PR: Pcol. 361 and consent. (For advanced graduate students.) Critical evaluation of preparation and delivery of lectures in specified areas of pharmacology and toxicology.

491. *Advanced Study.* I, II. 1-6 hr. PR: Consent of chairperson.

497. *Research.* I, II, S. 1-15 hr. per sem.

PHYSICAL EDUCATION

J. William Douglas, Dean, School of Physical Education

258 Coliseum

Carl P. Bahneman, Chairperson, Department of Health, Physical Education, and Athletic Training

256 Coliseum

William L. Alsop, Chairperson, Department of Sport and Exercise Studies

265 Coliseum

Degrees Offered: Master of Science

Physical Education Areas of Emphasis for:

Certificate of Advanced Study (Education)

Doctor of Education (Education)

Graduate Faculty: Members Bahneman, Branch, Brooks, J. W. Douglas, Hawkins, Morton, Ostrow, Ullrich, Wiegand, and Yeater. Associate Members Carson, Etzel, Kurucz, McPherson, Maxwell, and Ott.

Graduate students in the School of Physical Education pursue courses and scholarly tasks which may lead to the Master of Science in Physical Education or the Doctor of Education, with concentrations in professional physical education or sport and exercise studies. Admission deadlines vary across program areas. Students who seek a graduate assistantship should apply by March 1.

Master of Science (M.S.)

Professional Physical Education Department Admission Standards

Students are admitted to the Department of Professional Physical Education for work leading to the master of science degree if they hold a baccalaureate degree from an approved institution of higher education, have a 2.75 undergraduate grade-point average, and satisfy prerequisites in the courses for which they register.

Students who do not meet the 2.75 grade-point average requirement are admitted as provisional graduate students and are required to attain a 3.0 grade-point average in the first 12 hours of prescribed course work in order to be reclassified as a regular graduate student. Courses taken in off-campus education are accepted for degree purposes if the student has had prior approval from the student's adviser. In order to receive the degree, the student must have a minimum average of 3.0 in all course work leading toward the degree and satisfy all department and University requirements.

Professional Physical Education Department Programs

The Department of Professional Physical Education offers the master of science degree with the following options. Specific course requirements are available upon request.

A. *Motor Development/Master Teacher Program*—(1) Internship Option: This option is designed to develop a master teacher for the public school population. Mainstreaming and individualized instructional skills are emphasized together with a developmental focus; (2) Research Option: This option is very similar to the master teacher option. However, more emphasis is placed on the development of research skills, with a thesis being required.

B. *Athletic Training*—This option is designed to develop the skills necessary to be an athletic trainer. West Virginia State certification in athletic training is awarded upon completion. Students who cannot attend classes during the regular school year can complete this option in three consecutive summers.

Sport and Exercise Studies Department Admission Standards

Students are admitted to the Department of Sport and Exercise Studies for work leading to the master of science degree if they hold a baccalaureate degree from an approved institution of higher education and satisfy other admission criteria designated by the program specialization area (available upon request). Admission to the sport and exercise studies program areas is highly competitive and limited to 15 students per program emphasis; applications should be submitted by March 1. In order to receive the degree, the student must have a minimum 3.0 average in all course work leading toward the degree and satisfy all department and University requirements.

Sport and Exercise Studies Department Programs

The Department of Sport and Exercise Studies offers the master of science degree with the following areas of specialization. Specific course requirements are available upon request.

A. *Sport Studies*—(1) Sport Behavior: This specialization concentrates on the psycho/social dimensions of sport. A thesis is required. (2) Sport Management: The emphasis is on management and administration of sport related agencies and enterprises.

B. *Exercise Studies*—(1) Fitness Assessment, Evaluation and Prescription: The emphasis concentrates on assessment and evaluation of fitness parameters of all age groups involved in physical activity. Thesis or Internship option.

Doctor of Education (Ed.D.)

Professional Physical Education and Sport and Exercise Studies Departments

Options leading to the Doctor of Education (Ed.D.) degree in the Department of Professional Physical Education include motor development (with emphasis in pedagogy and special populations) and administration of sport and physical education. Options leading to the Doctor of Education degree in the Department of Sport and Exercise Studies include sport behavior and sport physiology.

Admission to the Program

Regular Graduate Student Status—The following are minimum admission criteria for students to be admitted with regular status to the options in motor development, administration of physical education, and sport behavior. Students interested in sport physiology should consult the latest department guidelines:

- Undergraduate grade-point average of 3.0 from an approved institution;
- Master's degree grade-point average of 3.5 from an approved institution;
- Graduate Record Examination score of 1050 (verbal/quantitative) or Miller Analogies Test score of 55;
- TOEFL score of 550 (international applicants); and
- Three letters of reference.

All materials and procedures must be completed by March 1 of the year in which the applicant intends to begin a doctoral program. Upon completion of the above procedures, the student's credentials are reviewed by an appropriate screening committee. Acceptance as an advanced graduate student with regular status is contingent upon the screening committee's decision regarding the applicant's potential for scholarly productivity as judged by Graduate Record Examination and/or Miller Analogies Test scores, past performance in course work, letters of recommendation, a personal interview, and adviser/program availability.

Provisional Graduate Student Status—Applicants who have incomplete credentials, deficiencies to make up, or a less than minimum required test score or grade-point average but who show scholarly promise may be admitted as advanced graduate students with provisional status. During the semester in which the advanced graduate student with provisional status completes the twelfth hour of prescribed course work, the student shall request, through the office of the chairperson of the appropriate doctoral program, admission to the program with regular graduate status. Advanced graduate students with provisional status cannot register for course work beyond the twelfth hour without having been admitted to the program as a student with regular graduate status.

Program Requirements—Once the student is admitted to the program, the student—in concert with the adviser—selects a doctoral committee. It is this committee's responsibility to aid the student in planning the total program. During the process of completing a program, the student is expected to fulfill a residency requirement specified by the committee.

Admission to Candidacy Requirements—As the student nears the termination of the course work, application may be made to complete the final comprehensive examination. This examination shall consist of scholarly tasks designed to function as a comprehensive learning experience. The examination will be constructed by the student's doctoral committee. Students who do not successfully complete this examination may be permitted to attempt the examination one more time pending an appeal and subsequent sanction of the student's doctoral committee. There must be a time period of at least six months between the first and second examination periods.

Upon successful completion of the final comprehensive examination, the student may present to the doctoral committee a prospectus of the dissertation. If the opinion of the committee is such that the student may proceed with the dissertation, the student is admitted to candidacy.

Final Requirements—Upon the completion of the dissertation, the candidate will appear before the doctoral committee for purposes of orally defending the study. Successful defense of the dissertation results in the awarding of the degree. All requirements must be completed within five years after the comprehensive examination is completed successfully.

Professional Physical Education (P.P.E.)

219. **Gross Anatomy. II. 3 hr. PR: Consent.** Designed to provide an overview of body systems and gross anatomy of the trunk and extremities.
220. **Advanced Athletic Training 1. S. 3 hr. PR: P.P.E. 121, S.E.S. 164, 165, Saf. S. 70 or consent.** Designed to provide an in-depth analysis of life-threatening situations in athletics, athletic conditioning, and general rehabilitation concepts.
221. **Advanced Athletic Training 2. I, S. 3 hr. PR: P.P.E. 121, 219, S.E.S. 164, 165, Saf. S. 70 or consent.** Designed to investigate tissue repair, physiology of hot and cold treatment, therapeutic modalities and pharmacology relevant to athletic injury management.
222. **Advanced Athletic Training 3. II, S. 3 hr. PR: P.P.E. 219, 220, 221 or consent.** Designed to provide in-depth analysis of athletic injury mechanisms, injury evaluation techniques and rehabilitation; and muscle isolation techniques.
223. **Athletic Training Practicum 1. II. 3 hr. PR: Consent.** Practical application of athletic training techniques related to general rehabilitation concepts.
224. **Athletic Training Practicum 2. 3 hr. PR: Consent.** Practical application of athletic training techniques.

225. *Program Planning of Recreational Sport.* I, II, S. 3 hr. PR: Consent. An in-depth study of recreational sport programs, including philosophy, objectives, program development, management concepts, and evaluation.

300. *Workshop in Physical Education.* I, II, S. 1-15 hr.

305. *Professional Issues in Physical Education.* S. 3 hr. PR: Completion of 24 graduate hours or consent. Designed to examine current professional issues in physical education and the impact of these issues on the professional's life.

315. *Research Methodology in Physical Education.* I, S. 3 hr. PR: Graduate standing or consent. Designed for the application of historical, descriptive, and experimental research strategies and designs to physical education.

323. *Athletic Training Practicum.* I, II, S. 1-6 hr. PR: Consent. Designed to provide experience in various practical situations in athletic training and other related areas.

324. *Issues in Athletic Training.* S. 3 hr. PR: Consent. Designed to analyze, in-depth, various issues and policies in athletic training relevant to training room administration, protective, equipment, liability in athletics, and other selected topics.

336. *Instructional Methods for Physical Education.* I, S. 3 hr. PR: P.P.E. 315 or consent. Designed to provide physical educators with the methodological skill necessary to comply with Public Law 94-142 (Education for All Handicapped Children Act). The research justification for the methodological approaches examined will be emphasized. (Offered every third Summer; next offering: 1985.)

338. *Operant Principles for Physical Education.* II, S. 3 hr. PR: P.P.E. 315 or consent. Designed for the use and evaluation of operant principles in the development and control of motor behavior in physical education. Applications will be made to traditional group and individually prescribed instructional systems in physical education. (Offered every third Summer; next offering: 1987.)

346. *Curriculum in Physical Education.* I, S. 3 hr. PR: P.P.E. 315 or consent. Designed to examine the factors affecting curriculum development. Emphasis on research in the changing curriculum, and the selection and sequencing of developmentally appropriate activities for early, middle, and adolescent childhood. (Offered every third Summer; next offering: 1986.)

366. *Motor Development.* I, S. 3 hr. PR: P.P.E. 315 or consent. Designed to examine developmental motor skill acquisition across the entire life span. Hereditary and environmental factors unique to the motor-skill development of the maturing individual will be emphasized. (Offered every third Summer; next offering: 1987.)

368. *Infant/Early Childhood Motor Development.* II, S. 3 hr. PR: P.P.E. 315 and 366 or consent. Examination of motor development during infancy and early childhood focusing on physical education's interactive role with the developmental process. Emphasizing current developmental research related to the area.

370. *Middle Childhood/Adolescent Motor Development.* II, S. 3 hr. PR: P.P.E. 315 and P.P.E. 366 or consent. Examination of motor development during middle childhood and adolescence focusing on physical education's interactive role with the developmental process. Emphasizes current developmental research related to the area.

371. *Motor Development in Special Populations.* II, S. 3 hr. PR: P.P.E. 315, 366 or consent. Designed to examine the motor developmental patterns of various special population groups focusing on physical education's interactive role with the developmental process. Current developmental research related to the area will be emphasized. (Offered every third Summer; next offering: 1985.)

391. *Advanced Topics.* I, II, S. 1-6 hr.

397. *Research/Thesis. I, II, S. 1-15 hr.*

446. *Advanced Measurement in Physical Education. II, S. 3 hr. PR: P.P.E. 315.* Designed to extend and apply the basic concepts of measurements and statistical evaluation to physical education.

460. *Management Processes in Physical Education. II. 3 hr. PR: Graduate standing or consent.* Designed to explore analytically the situational, relational processes between the administrator of physical education school programs and the teacher of physical education, the physical education facility, and the physical education planned learning environment.

465. *Professional Physical Education Resource Seminar. I. 3 hr. PR: Graduate standing. (Required for all doctoral students.)* Designed as an introductory seminar for doctoral professional physical educators. Discussion, debate, and position statements on critical issues facing the physical education profession.

480. *Dissertation/Thesis Seminar. I, II, S. 3 hr. PR: Graduate standing and S.E.S. 315. (Required for all doctoral students.)* Designed to critically analyze the graduate student's dissertation or research proposal.

490. *Teaching Practicum. I, II, S. 3-15 hr.*

491. *Advanced Study. I, II, S. 1-6 hr.*

492-495. *Special Seminars. I, II, S. 1-6 hr. each.*

496. *Graduate Seminar. I, II, S. 1-6 hr.*

497. *Research. I, II, S. 1-15 hr.*

498. *Dissertation. I, II, S. 1-15 hr.*

499. *Colloquium. I, II, S. 1-6 hr.*

Dance (Dance)

201. *Rhythms and Dance. I. 3 hr.* An exploration of dance technique in its relation to composition and principles of choreography; developing an aesthetic and critical awareness of these principles as they are displayed in dance works.

202. *Modern Dance Techniques and Composition. II. 3 hr. PR: Dance 35 or 37 or consent.* Scientific principles of movement; basic principles of music as related to dance movement; choreographic principles; practicum in dance movement. Principles for teaching dance and problems involved in planning programs.

203. *American Folk Dance. I. 3 hr. PR: Dance 39 or consent.* American square, contra, circle, and round dance, and their relationships in the arts and aspects of American culture.

204. *History and Philosophy of Dance. II. 3 hr.* Cultural survey of dance as an expression of the society it represents; philosophy of dance; relation of dance to other art forms; dance as an educational experience.

210. *Theatre Dance 1. I. 2 hr. PR: Dance 9.* Develops a basic practical knowledge of choreographed movement in the musical theatre dance idiom. Includes a study of fundamentals of ballet for the actor, derivative musical/rhythmic forms, and elementary Broadway dance vocabulary and styles. (Also listed as Theat. 210.)

211. *Theatre Dance 2. II. 2 hr. PR: Theat. 210/Dance 210.* Comprehensive study of representative musical theatre dance styles, relative to period (1900 to present) and ethnic derivation. Includes study of isolationary movement and principles of classical dance applicable to the Broadway idiom. (Also listed as Theat. 211.)

212. *Theatre Dance Repertory*. I. 2 hr. PR: Dance 211/Theat. 211. Develops and expands the technical and stylistic fundamentals established in the Dance 210-211/Theat. 210-211 courses, applying them to reconstruction and staging of a variety of classic dance sequences from notable Broadway musicals. (Also listed as Theat. 212.)

213. *Theatre Dance Performance Workshop*. II. 2 hr. PR: Dance 212/Theat. 212. Continues study of dance technique, isolatory movement and stylistic vocabularies established in previous theatre dance courses. Emphasizes development of original choreography in representative Broadway dance styles. Includes study of elements of performance in musical theatre. (Also listed as Theat. 213.)

Sport and Exercise Studies (S.E.S.)

225. *Program Planning of Recreational Sport*. I, II, S. 3 hr. PR: Consent. An in-depth study of recreational sport programs, including philosophy, objectives, program development, management concepts, and evaluation.

315. *Research Methodology in Physical Education*. I, S. 3 hr. PR: Graduate standing or consent. Application of historical, descriptive, and experimental research strategies and designs to physical education. (Also listed as P.P.E. 315.)

320. *Individual Interaction in Sport and Physical Activity*. I, S. 3 hr. PR: S.E.S. 315. Designed to acquaint the student with the reciprocal relationships between sport and physical activity and the societies and cultures out of which sport emerges.

340. *Psychology of Sport and Physical Activity*. I, S. 3 hr. PR: S.E.S. 315. Psychological effects and implications of man's participation in sport and physical activity. Emphasis is on the personality and behavioral and motivational dynamics of sport involvement.

345. *Group Influences in Sports*. I. 3 hr. PR: Research, Statistics, S.E.S. 320, 340. The manner and degree to which individuals are affected by involvement in sport and group interactions.

360. *Biomechanical Analysis of Sport and Physical Activity*. II, S. 3 hr. PR: S.E.S. 164 and 165 or equiv.; S.E.S. 315. Advanced principles of body mechanics and analysis of muscle and joint actions in coordinated movement and neuromuscular physiology.

367. *Theories of Sport Physiology*. I, S. 3 hr. PR: S.E.S. 315. Thorough and workable knowledge of principles involved in the interactions of muscles and nerves, reflexes, metabolism, cardiopulmonary function, environmental physiology, and the practical application of work physiology.

391. *Advanced Topics*. I, II, S. 1-6 hr.

397. *Research/Thesis*. I, II, S. 1-15 hr.

425. *Educational Sport*. II. 3 hr. PR: Stat. 311, S.E.S. 465. The group dynamics of the sport situation for purposes of gaining insight into techniques and methods of modifying social behavior through physical education sport activities.

446. *Advanced Measurement in Physical Education*. II, S. 3 hr. PR: S.E.S. 315. Extension and application of basic concepts of measurement and statistical evaluation to physical education.

460. *Management Processes in Physical Education*. II. 3 hr. PR: Graduate standing or consent. Analytical exploration of the situational, relational processes between the administrator of physical education school programs and the teacher of physical education, the physical education facility, and the physical education planned learning environment.

465. *Professional Physical Education Resource Seminar.* S. 3 hr. PR: Graduate standing. Introductory seminar for doctoral professional physical educators. Discussion, debate, and position statements on critical issues facing the physical education profession. (Required for all doctoral students.)

480. *Dissertation/Thesis Seminar.* I, II, S. 3 hr. PR: Graduate standing. Critical analysis of the graduate student's dissertation or research proposal. (Required for all doctoral students.)

491. *Advanced Study.* I, II, S. 1-6 hr.

492-495. *Special Seminars.* I, II, S. 1-6 hr. ea.

496. *Graduate Seminar.* I, II, S. 1-6 hr.

497. *Research.* I, II, S. 1-15 hr.

498. *Dissertation.* I, II, S. 1-15 hr.

499. *Colloquium.* I, II, S. 1-6 hr.

PHYSICS

Arthur S. Pavlovic, Chairperson of the Department
212 Hodges Hall

Degrees Offered: Master of Science
Doctor of Philosophy

Graduate Faculty: Members Cooper, Edwards, Ferer, F. Franz, Giles, Koepke, Littleton, Pavlovic, Seehra, Weldon, and Wilson. Associate Members Arya, Levine, Rotter, and Treat.

The Department of Physics offers the master of science and the doctor of philosophy degrees with research specialties in: (1) condensed matter (magnetic phenomena in highly correlated rare earth and actinide systems; electronic structure and magnetic properties of artificially grown solid state surfaces and superlattices; high T_c superconductors; properties of magnetic ions and clusters; elementary excitations in antiferromagnets; phase transitions and critical phenomena; metal-insulator transitions and electron localization; optical properties of semiconductors; materials deposition, X-ray diffraction; nonlinear fluid dynamics, chaos, and nonequilibrium pattern formation), (2) applied physics (fractals and percolation clusters; formation, growth, and interaction of aerosols; biophysics of particle ingestion; atmospheric physics and the propagation of electromagnetic waves), (3) plasma physics (plasma waves and instabilities; nonlinear interactions in steady state plasma columns; turbulence in plasmas), (4) astrophysics (stellar evolution; detonation waves in supernovae; heavy element production), (6) elementary particle physics (high temperature quantum field theory; quark-gluon plasmas; supersymmetry; cosmology).

The physics department is a member of the Southeastern Universities Research Association and Oak Ridge Associated Universities and an academic affiliate of the Pittsburgh Supercomputer Center. There are active collaborations with Brookhaven, Los Alamos, and Argonne National Laboratories and the Continuous Electron Beam Accelerator Facility. There is a well-equipped professional machine shop and a student shop. Computing facilities are excellent: faculty and students use microcomputers, VAX and mainframe IBM computers, and supercomputers through national communications networks.

The Ph.D. Degree

A Ph.D. degree requires 36 hours of course work at the 300 or 400 level. The following courses are required: 325, 331, 333, 351, 352, 383, and 387. A minimum of six hours at the 400 level is required. The minimum grade for credit in graduate courses is C. A grade-point average of 3.0 (B) must be maintained.

Admissions Exam: The first two years of courses prepare the student for the admissions exam. The purpose of the exam is to determine whether a student has the necessary general background to begin research. It is a written exam covering electricity and magnetism, classical mechanics, and quantum mechanics at the beginning graduate level. This exam is offered twice a year and is normally taken after two years of graduate study.

Qualifying Exam: After completing the admissions exam the student chooses a general area of research and an adviser, and starts work on a research project. During this period the advisor and the student select a very specific sub-field of current research (usually based on a few published papers or a textbook) that the student can master rather quickly. The qualifying exam consists of a seminar by the student on this sub-field followed by questions from a faculty examining committee. This requirement is usually completed before the fourth year of graduate study. Upon completion, the student is formally advanced to candidacy for the Ph.D. and focuses entirely on research.

Dissertation: The Ph.D. degree is primarily a research degree and consequently the student must demonstrate the ability to do independent research under the guidance of an advisor. The results of this research must be written up as a formal dissertation and defended orally in front of a faculty examining committee.

Language Requirement: The student must demonstrate proficiency in an approved foreign language or in computer programming.

The Master's Degree

The master's degree requires 24 hours of course work at the 300 or 400 level including the following required courses: 331, 333, 351, and 387. The minimum grade for credit is C and a grade-point average of 3.0 (B) must be maintained. A thesis is required and is considered a valuable part of the master's program because it gives the student experience in working on a research problem, writing up the results, and defending the work in an oral exam. Although the master's projects are more limited in scope than Ph.D. research, they are essential to master's degree training and often lead to a journal publication. A master's candidate must take the Ph.D. Admissions Exam described previously and demonstrate competence in two of the three sections. Our master's program provides valuable training as a terminal degree or as preparation for the Ph.D., although it is not required for the Ph.D.

In addition to the Ph.D. and M.S. programs, the department offers a series of courses during the summer designed specifically for teachers. They cover physics, physical science, and astronomy.

Application and Admission

Applications are due by March 1. All applicants will be considered for financial support. Applicants are expected to have a bachelor's degree in physics that includes upper-division courses in electricity and magnetism, mechanics, quantum mechanics, thermodynamics, and mathematical methods. Students lacking some of these courses may be admitted provisionally and

will be encouraged to remedy the deficiencies by taking appropriate undergraduate courses during their first year.

To apply for admission applicants should send the following: (1) WVU admission application (Foreign students may defer paying the \$25 application fee), (2) official transcript of grades, (3) Graduate Record Exam (GRE) scores for analytical, verbal, and quantitative sections, (4) Graduate Record Exam (GRE) score for physics (077) or the CUSPEA exam in China, (5) summary of physics and math background (This form is included in the application package.), (6) Test of English as a Foreign Language (TOEFL) scores if English is not the applicant's native language (A minimum score of 550 is required.), and (7) three letters of recommendation from faculty describing the applicant's potential for completion of an advanced degree.

Physics (Phys.)

201. *Special Topics.* I, II. 1-6 hr. per sem. (May be repeated to max. of 24 hours.) Study of topics of current interest in physics.
213. *Introductory Electronics.* 3 hr. PR: Phys. 12. Principles and applications of integrated circuits and digital electronics. 2 hr. lec., 1 hr. lab.
221. *Optics.* 3 hr. PR: Phys. 12, Math. 18. A basic course in physical optics covering wave mathematics, propagation, polarization, interference, and diffraction; applications in geometrical optics and selected topics in scattering and quantum optics.
225. *Atomic Physics.* I, II. 3 hr. PR: Phys. 124 or equiv. Relativistic mechanics, atomic structure, and spectra.
- 231, 232. *Theoretical Mechanics.* I, II. 3 hr. per sem. PR: Phys. 11, 12 or equiv.; Conc.: Math. 18. Scalar, vector, and tensor fields; curvilinear coordinate systems. Kinematics and dynamics of particles, systems, of particles and rigid bodies. Lagrangian and Hamiltonian formulation. Relativistic motion.
- 233, 234. *Electricity and Magnetism.* I, II. 3 hr. PR: Phys. 12, Math. 18. Electrostatics, electrostatics in matter, magnetostatics, magnetostatics in matter, Maxwell's equations, reflection and refraction, wave guides and cavities.
241. *Advanced Physics Laboratory.* I, II. 1-2 hr. per sem. PR: Phys. 11, 12, 124. Experiments in physics designed to implement theory courses, give experience in data taking and instrumentation, and learn methods of data evaluation and error analysis.
248. *Physics Seminar.* I, II. (No credit.) (Suggested for junior, senior, and graduate Physics majors.) These lectures acquaint students with topics of current interest in physics.
251. *Introductory Quantum Mechanics.* I. 3 hr. PR: Phys. 124, Math. 18. Fundamental principles of quantum mechanics; state functions in position and momentum space, operators, Schrodinger's equation, applications to one-dimensional problems, approximation methods, the hydrogen atom, angular momentum and spin.
263. *Nuclear Physics.* I, II. 3 hr. PR: Phys. 124; Math. 17. Study of characteristic properties of nuclei and their structure as inferred from nuclear decays and reactions, leading to a knowledge of nuclear forces and models.
271. *Solid State Physics.* I, II. 3 hr. PR: Phys. 124 or equiv.; Math. 17. Properties of crystalline solids; includes crystal structure, binding, lattice vibrations and an investigation of thermal, electrical, magnetic, and optical phenomena based on energy band theory.
281. *Plasma Physics.* 3 hr. Phys. 12, Conc: Phys. 234. Introductory course in the physics of ionized gases; particle and fluid treatment of plasmas, waves, equilibrium and stability, kinetic theory, and nonlinear effects.

283. *Thermodynamics and Statistical Mechanics.* II. 3 hr. PR: Phys. 124 or equiv.; Math. 17. Introduction to the statistical foundations of thermodynamics; applications of the fundamental laws of thermodynamics to physical and chemical systems.

301. *Special Topics.* I, II. 1-6 hr. per sem. (May be repeated to max. of 24 hours.) PR: Consent. (Primarily for Graduate students.) Specialized topics of current interest in physics.

321. *Optics.* I, II. 3 hr. PR: Phys. 11, 12 or equiv.; Math. 17. A basic course in physical optics covering radiation theory, diffraction, interference, polychromatic waves, scattering, polarization, double refraction, and selected topics in quantum optics.

325. *Intermediate Atomic Physics.* I. 3 hr. PR: Phys. 351. A review of the theory of one-electron atoms. The main emphasis is on the theory of two-electron and many-electron atoms: para and ortho helium; central field approximation; Thomas-Fermi theory; Hartree-Fock theory; L-S, J-J, and intermediate coupling; interaction with electromagnetic fields.

331. *Advanced Classical Mechanics.* I. 3 hr. PR: Phys. 231, 232, and differential equations. Lagrange and Hamilton form of equations of motion, rigid bodies, small and nonlinear oscillations. Transformation theory, relativistic dynamics, and systems with an infinite number of degrees of freedom.

333, 334. *Advanced Electricity and Magnetism.* I, II. 3 hr. per sem. PR: Phys. 233, 234, and differential equations. Electrostatic and magnetostatic boundary value problems. Maxwell's equations for time varying fields. Green's functions and integral representations; applications to radiation; diffraction, wave guides, plasma physics, and relativistic motion of charged particles.

351, 352. *Quantum Mechanics.* I, II. 3 hr. per sem. PR: Phys. 251. Breakdown of classical physics, the Schroedinger equation and its interpretation, one dimensional problems, operator methods and abstract Hilbert space, identical particles, three dimensional problems, the hydrogen atom, angular momentum, spin, vector coupling, time independent perturbation theory, variational principle, atomic and molecular structure, semiclassical radiation theory, scattering theory.

354. *Outline of Physics.* S. 3 hr. PR: One year introductory college physics. (Primarily for education majors; not open to physics majors.) Elementary study of atomic and molecular structures and spectra, solid state and nuclear physics, relativity and elementary particles.

355, 356. *Workshop for Physics Teachers.* S. 3 hr. per sem. PR: One year college physics; One year of college mathematics. (Primarily for Education majors; not open to Physics majors.) Techniques of apparatus construction and demonstration.

358. *Light.* SII. 3 hr. PR: One year of college physics or equiv. (Primarily for education majors; not open to physics majors.) A demonstration course designed to illustrate the basic concepts covering light and optics.

371, 372. *Intermediate Solid State Physics.* 3 hr. PR: Phys. 271, 351, or equiv. Crystal structure, reciprocal lattice, phonons, dielectric properties, optical properties, semiconductors, cooperative phenomena including superconductivity and magnetism.

383. *Statistical Mechanics.* II. 3 hr. PR: Phys. 283, 351. Ensemble theory, applications to noninteracting systems, as well as perturbative and approximate treatment of interactions. Typical applications include equilibrium constants, polymers, white dwarves, metals, superfluids, magnetic transitions.

387. *Mathematics for Physicists and Engineers. I.* 3 hr. PR: Calculus, differential equations, Phys. 11, 12 or equiv. Complex variables: series, contour integration and conformal mapping; ordinary differential equations; Fourier series, Laplace transforms; Fourier transforms, special functions; Bessel functions and Legendre, Hermite, and Laguerre polynomials; introduction to partial differential equations; Poisson's equation, Wave equation, and diffusion equation.

388. *Mathematics for Physicists and Engineers. II.* 3 hr. PR: Calculus, differential equations, Phys. 11, 12 or equiv. Vector spaces, tensor calculus, group theory, integral equations, calculus of variations, nonlinear systems and other topics as time permits.

401. *Advanced Research Topics. I, II.* 1-6 hr. (May be repeated to max. of 24 hours.) PR: Consent. Specialized topics in field of physics related to the research interests of the department. Open only to students who have completed most of the basic graduate courses.

410. *High Energy Physics. I.* 3 hr. PR: Phys. 351, 352. Fundamental particle interactions, field theory, s-matrix expansions, space time symmetries, internal symmetries, unsolved problems.

463. *Advanced Nuclear Physics. I, II.* 3 hr. PR: Phys. 225, 251, and 263. Detailed presentation of nuclear presentation of nuclear models, nuclear reaction mechanism, nuclear forces and theories of nuclear disintegrations.

471. *Advanced Solid State Physics. II. (Alternate Years.)* 3 hr. PR: Phys. 271, 325, 351. Advanced treatment of solid state theory; electronic, vibrational, transport, thermodynamic, and magnetic properties of solids.

497. *Research. I, II, S.* 1-15 hr.

Astronomy (Astro.)

216. *Astronomy for Teachers. S.* 3 hr. PR: Consent. Basic concepts and methods in astronomy and how to teach them using the celestial sphere and geometrical tools. Observational work at night. The use of a telescope and camera.

255. *Intermediate Astronomy. II.* 3 hr. PR: Math. 16 or consent. Measurement of the universe; trigonometric parallax, statistical parallax, moving clusters, cluster H-R diagrams, masses of various binary systems, Kepler's Laws, and the three-body problem.

267. *Basic Astrophysics. I, II.* 3 hr. PR: Phys. 124 or equiv. The several equations of state, the Boltzmann-Saha equation, the H-R diagram and interpretation of spectra, introduction to radiative transfer and stellar structure.

PHYSIOLOGY

George A. Hedge, Chairperson of the Department
3051 Health Sciences Center

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Baylis, Brown, Castranova, Connors, Franz, Frazer, Gladfelter, Goodman, Hedge, Johnson, Lee, Miles, Millecchia, Overbeck, Stauber, and Yokota. Associate member Huffman.

The Ph.D. program is designed to produce physiologists of high quality, capable of conducting independent research and being effective teachers. Students in the department are exposed to all aspects of physiology and a variety of related sciences. Our graduates, as a result of this rigorous training, may pursue careers in any area of physiology, and can interact creatively with scientists in related fields. The Master's program is designed as an introduction

to research in physiology for students interested in, but not yet committed to, a research career. Students in this program receive training in the fundamentals of physiology and experience in a research laboratory.

Admission Requirements

Applicants should have a strong background in biology and/or chemistry. In addition to a basic biology course, it is strongly recommended that applicants have taken cellular or molecular biology and an introductory physiology course; a course on comparative anatomy also provides particularly useful background information. Inorganic and organic chemistry are basic requirements, while physical chemistry is recommended, but not required. Finally, as several areas of physiology require an understanding of the fundamentals of calculus and physics, introductory courses on these subjects are also essential.

The department requires the following materials for consideration for the M.S. or Ph.D. program: Three letters of recommendation; transcripts of all undergraduate and graduate grades; a completed departmental application form; and Graduate Record Examination scores (aptitude and one advanced test). A bachelor's degree, or equivalent, is required for admission; an M.S. degree is not a prerequisite for the Ph.D. program.

A complete application kit and detailed descriptions of the degree programs can be obtained by writing to the Graduate Adviser, Department of Physiology, School of Medicine, West Virginia University, Morgantown, WV 26506. Although applications may be submitted as late as May of the year of matriculation, applications must be received before February 1 to be considered for financial aid.

Master of Science (M.S.)

Prerequisites for admission to the master's program are the same as those for the doctoral program. The first two semesters are devoted largely to course work in physiology (12 hours of graduate physiology, four hours of neurophysiology, and four hours of physiological methods). Students are also introduced to the research interests of the faculty through the graduate colloquium and physiological methods (two hours per semester), which includes rotations in each faculty member's laboratory. At the end of the second semester, students pick a thesis adviser and begin work in that laboratory during the summer. The second year is spent primarily on research for and writing of the master's thesis. Students are required to take two hours of advanced physiology and present two research seminars during the year.

Doctor of Philosophy (Ph.D.)

The first year curriculum familiarizes the student with the basic information and principles that form a background for advanced work in physiology. Much of this overlaps with the basic science material presented to medical students so that all students attend several medical school courses, including biochemistry and neurophysiology. Much of the first year is devoted to graduate physiology (six hours/semester). This course is based upon lectures in medical physiology, supplemented with conference sessions that introduce students to current literature. Finally, students lacking a statistical background are expected to take a basic statistics course.

In addition to this course work, students are introduced to the research interests of the physiology faculty through the graduate colloquium and rotations in each faculty member's laboratory. The latter are designed to help

students choose a thesis adviser by exposing them to the experimental approaches and techniques used in different laboratories within the department.

During the first summer, students are expected to begin research projects in a departmental research laboratory of their choice. This allows a student to explore an area of research interest, and to develop a working relationship with a faculty member, without a firm commitment to pursue a thesis project in that laboratory.

During the second year the student combines course work with the continuing development of research interests. A graduate adviser is selected during this year. Courses include: advanced physiology (12 hours), cell biology (three hours), molecular biology (three hours), graduate colloquium (two hours), graduate seminar (one hour), and a teaching practicum.

The second-year curriculum takes the student beyond the medical curriculum, emphasizing critical appraisal of the current research literature. In addition, the student begins to develop his/her teaching skills. The purposes of the graduate colloquium and seminar are two-fold. First, they give students an opportunity to become informed of the latest scientific advances. Secondly students have an opportunity to develop and practice presentation of research seminars. In addition to presentations by faculty and students from the Department of Physiology, faculty members from other departments at WVU and from other institutions are invited to present seminars in the program.

After successful completion of the second academic year, the student takes a two-part qualifying examination. The qualifying examination consists of a comprehensive written examination covering all of the major areas of physiology, followed by a written and oral research design examination. Upon successful completion of the qualifying examination, the student is admitted to candidacy for the degree of Doctor of Philosophy.

During the third and fourth years the student may enroll in elective courses. Yearly participation in the teaching practicum provides additional experience in delivering lectures to undergraduate and professional students. However, the student's major effort is directed toward dissertation research. Results of this effort are presented annually in the graduate colloquium. During these years the student will attend and present papers at national meetings of scientific societies (e.g., American Physiological Society, Biophysical Society, Endocrine Society, Federation of American Societies for Experimental Biology, Society for Neurosciences). The Ph.D. degree generally can be completed in four years.

Research and Instruction

Research Areas—Faculty laboratories offer opportunities for research in cardiovascular, cell, gastrointestinal, endocrine, muscle, neural, renal, and respiratory physiology.

Physiology (Physi.)

241. *Mechanisms of Body Function.* I. 4 hr. PR: College chemistry, biology, physics, and algebra or graduate status and consent. A systematic examination of the homeostatic functions of the human body with emphasis on the physicochemical mechanisms involved. Pathophysiology and clinical correlations are introduced in relation to normal physiology.

248. *Experimental Design.* (For advanced undergraduate and selected graduate students.) II. 3 hr. PR: Consent. Theory and practical experience in design of experiments and processing of physiological data using small laboratory digital computers. 1 lec., 2 lab.

341. *Physiological Methods 1.* II. 1-5 hr. PR: Consent. Research techniques and strategies for physiology.

342. *Physiological Methods 2.* I. 1-4 hr. PR: Consent. Research techniques and strategies for physiology.

343. *Fundamentals of Physiology.* (For dental students and a limited number of regular full-time graduate students in health sciences basic sciences departments.) I. 5 hr. PR: College physics, algebra, chemistry, and consent of department chairperson. Analysis of basic facts and concepts relating to cellular processes, organ systems, and their control. 3 lec., 1 conf., 1 lab.

344. *Medical Physiology 1.* (For medical and a limited number of regular full-time graduate students in health sciences basic sciences departments.) I. 5 hr. PR: College physics, algebra, chemistry, and consent of department chairperson. Analysis of basic facts and concepts relating to cellular processes, organ systems, and their control, with clinical correlations. 5 lec., 1 conf.-lab.

345. *Medical Physiology 2.* (For medical and a limited number of regular full-time graduate students in health sciences basic sciences departments.) II. 5 hr. PR: Physi. 344 and consent of department chairperson. Continuation of Physi. 344. 5 lec., 1 conf.-lab.

346. *Neurophysiology.* (For graduate students in health sciences basic sciences departments and a limited number of regular full-time graduate students.) II. 1-4 hr. PR: Math. 3 or 141, Phys. 1 and 2 or consent of department chairperson. Properties of excitable tissues (nerve and muscle), synaptic transmission, reflexes and central nervous system function, and behavior. 1-3 lec., 1 conf.

350. *Graduate Physiology 1.* (For graduate students in health sciences basic sciences departments and a limited number of other regular full-time graduate students.) I. 6 hr. PR: Calculus, college physics, organic chemistry, biology, and consent of department chairperson. Analysis of basic facts and concepts relating to cellular processes, organic systems, and their control.

351. *Graduate Physiology 2.* (For graduate students in the health sciences basic sciences departments and a limited number of other regular full-time graduate students.) II. 6 hr. PR: Physi. 344 or 350 and consent of department chairperson. Continuation of Physi. 350.

399. *Special Topics.* I, II, S. 1-4 hr. PR: Consent. Assigned study designed to develop research skills.

444. *Graduate Seminar.* I, II. 2 hr. PR: Graduate standing and consent. (Graded as S or U.)

490. *Teaching Practicum.* I, II. 1-3 hr. PR: Consent. Supervised practices in college teaching of physiology. (Graded as S or U.)

491. *Advanced Physiology.* I, II, S. 1-15 hr. PR: Consent. Lecture-conference in: cellular physiology, neurophysiology, circulation, respiration, acid-base and renal physiology, digestion and energy metabolism, and endocrinology. 3 lec., 3 conf.

497. *Research in Physiology.* I, II, S. 1-15 hr.

498. *Thesis.* I, II, S. 2-4 hr. PR: Consent. (Graded as S or U.)

499. *Graduate Colloquium.* I, II. 1 hr. PR: Consent. (Graded as S or U.)

PLANT PATHOLOGY

William L. MacDonald, In Charge of the Graduate Program in Plant Pathology
528 Brooks Hall

Degree Offered: Master of Science

Graduate Faculty: Members Biggs, Hindal, Kotcon, MacDonald, Morton, and Stelzig.
Associate Member Young.

Graduate studies in plant pathology leading to the master of science degree deal with the biology and control of plant diseases. The teaching and research faculty is composed of six full-time members with special interests in the areas of forage, ornamental, forest, vegetable and fruit-tree pathology, as well as mycology and disease physiology.

Graduate training is designed to offer qualified students a broad background in the agricultural sciences through cooperation with other disciplines in the College of Agriculture and Forestry, College of Arts and Sciences, and School of Medicine.

The primary objective of the research and training program is to provide students with training for professional careers in plant pathology or other biology-related areas.

A thesis is required. Course work and research problems are designed by the student, the graduate adviser, and the advisory committee. Admission requirements are those of the College of Agriculture and Forestry. Students interested in the Ph.D. should apply for acceptance into the doctoral program in agricultural sciences.

Plant Pathology (P. Pth.)

201. General Plant Pathology. I. 4 hr. Nature and causes of plant diseases; methods of control.
301. Diseases of Economic Plants. I, II, S. 1-3 hr. per sem.; 2 hr. in Summer. PR: P. Pth. 201 or 303 or consent. Recognition, cause, and control of diseases of economic plants. [Sem. I—Diseases of vegetable crops and of tree and small fruits; Sem. II—Diseases of ornamental plants and field and forage crops; S—Diseases of forest trees. Students may register for 1-3 hr. in Sem. I and II, 2 hr. in Summer, until 8 hours of credit are accumulated.] (Offered in alternate years.)
302. Principles of Plant Pathology. II. 4 hr. PR: P. Pth. 153, 201, or 303, or consent. (Primarily for graduate students and seniors majoring in biology or agricultural science.) Nature of disease in plants with practice in laboratory methods. (Offered in Spring of even years.)
303. Mycology. I. 4 hr. Lectures and field and laboratory studies of parasitic and saprophytic fungi.
309. Nematology. II. 3 hr. (Primarily for graduate students majoring in the agricultural sciences or biology.) Nematode taxonomy, bionomics, and control, with particular emphasis on plant parasitic forms. (Offered in Spring of odd years.)
402. Physiology of Plant Diseases. I. 3 hr. PR: Ag. Bi. 310 and P. Pth. 302, or consent. Study of host-parasite interactions, with emphasis on physiological and biochemical changes that occur in higher plant tissues in response to pathogenic organisms.
430. Physiology of the Fungi. II. 4 hr. PR: Organic chemistry, mycology, and bacteriology, or consent. Physiological aspects of growth, reproduction, and parasitism of fungi, with emphasis on nutrition, environment, and other biotic factors. (Offered in Spring of odd years.)

440. *Taxonomy of the Fungi*. S. 3 hr. PR: P. Pth. 303. Collection and identification of fungi with emphasis upon those of economic importance. (Offered in Summer of even years.)

Plant Science (Pl. Sc.)

200. *Recognition and Diagnosis of Plant Disorders*. I. 4 hr. PR: P. Pth. 201 and Ento. 204. Creates an ability for the student to use systematic inspection to determine cause or causes of a plant disorder.

201. *Principles and Methods of Plant Pest Control*. II. 4 hr. PR: P. Pth. 201 and Ento. 204. Concepts of control and how they are implemented by exclusion, eradication, protection, and immunization.

420. *Special Topics*. I, II, S. 1-6 hr. Special study in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

450. *Seminar*. I, II. 1 hr. Graduate seminar in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

497. *Research*. I, II, S. 1-15 hr. Graduate research in agricultural microbiology, crop science, horticulture, plant pathology, or soil science.

POLITICAL SCIENCE

Allan S. Hammock, Chairperson of the Department

316-A Woodburn Hall

Degrees Offered: Master of Arts

Doctor of Philosophy

Graduate Faculty: Members Brisbin, DiClerico, Duval, Hedge, Hunter, Kim, and Yeager. Associate Members Bingham, Hammock, and Temple.

The master of arts and doctor of philosophy programs in political science are designed to give advanced training to students who desire a career in government or the private sector as policy analysts or who wish to enter selected teaching or research fields with a specialization in public policy.

Master of Arts with the Public Policy Option

The master of arts with emphasis in public policy is offered jointly by the Department of Political Science and the Department of Economics. It is designed to provide students with a broad knowledge of the policy making process and the many factors influencing public policies at the international, national, state, and local levels of government. A problem-analytic approach, drawn from both economics and political science, is used to develop the ability to comprehend, assess, and evaluate issues, problems, and policies in the public sector. Prospective graduates are expected to be skilled at gathering and interpreting data, reporting and writing, analyzing policy options and alternatives, and evaluating the intended and unintended consequences of public programs and policies. Most graduates will take jobs in government or private firms.

Eligibility. Ideally, applicants for the master of arts degree should have a B.A. in political science (with a minimum of six hours in economics) or a B.A. or B.S. in economics (with a minimum of six hours in political science). However, students from other fields and disciplines are also encouraged to apply. In addition, the applicant should have an overall grade-point average of 2.75, and should submit two letters of recommendation from faculty familiar with the student's work. Students must also submit Graduate Record Examination (general aptitude) test scores.

Course Requirements. In order to remain in good standing, students must maintain a 3.0 cumulative average and receive a 3.0 average in each semester for which they are enrolled. Students who do not maintain a 3.0 cumulative average will be placed on probation and will be suspended if they fail to regain a 3.0 cumulative average in their next nine hours of study. Students who do not achieve a 3.0 semester average will be placed on probation and will be suspended if they fail to achieve a 3.0 semester average in their next semester of enrollment.

Admission to candidacy for the M.A. degree requires that the student complete a minimum of 36 hours (exclusive of colloquium) in a specialized curriculum offered by the Department of Political Science and the Department of Economics. This curriculum includes courses in economics, policy evaluation, the policy process, and public policy analysis. In addition, students must complete work in political science methodology and statistical methods. All students must enroll in Pol. S. 499 (Colloquium) each semester in residence.

The M.A. degree provides an optional research practicum or internship during the fourth semester of work. The practicum enables the student to conduct actual policy research in a public agency. The practicum will carry an additional six hours of graduate credit. Students may also choose a six-hour thesis option.

Final Examinations. Students will be expected to pass final written/oral examinations in policy analysis. Students who fail examinations may be allowed to re-take them at the next regularly scheduled examination period. It is contrary to departmental policy to give a third examination.

Doctor of Philosophy (Public Policy) (Ph.D.)

The doctor of philosophy (Ph.D.) program is designed for persons in or planning to enter teaching or public sector management and policy analysis. The principal change in the discipline of political science in recent years has been increasing attention to and involvement with public policies. The Department of Political Science believes that a Ph.D. recipient should possess a comprehensive knowledge of political science as it relates to the formulation, implementation, and evaluation of public policies. This requires a thorough understanding of political dynamics and institutions, a knowledge of management tools and data management, and competence in research methodology and statistical techniques. Further, familiarity with a policy field and the contributions of related disciplines, particularly economics, is a distinct advantage to both the teacher-researcher and the policy analyst-manager.

Resources for Graduate Study. The Department of Political Science has 18 full-time faculty members. More than half of these faculty members are teaching in the policy studies graduate programs. In addition, faculty in the Departments of Public Administration and Economics teach in the M.A. and Ph.D. curriculums.

Graduate students have opportunities to perform research with the policy analysis group, with the Institute for Public Affairs, with individual faculty members, and on research grants. Opportunities exist for field experience in various governmental agencies.

Admission. Admission to the Ph.D. program is open to students with either a bachelor's or a master's degree. Students with degrees in political science, economics, public administration, sociology, psychology, engineering, social work, business, law, medicine, or journalism are encouraged to apply. An undergraduate applicant should have a grade-point average of 3.0; a graduate applicant 3.5. In addition, all applicants must submit the results of

the Graduate Record Examination and at least three letters of recommendations from faculty persons familiar with the applicant's work. Admission will be based on an overall assessment of the individual's record.

The work of all individuals admitted to the doctoral program will be formally evaluated at the end of the first two semesters (at least 18 credit hours of study) at which time one of the following recommendations will be made: (1) admission to candidacy for the doctoral degree; (2) admission to the master's degree program in public policy studies; or (3) termination.

Course Requirements. The program of each person admitted to the doctoral program is designed in accordance with his or her career objectives and previous training. A complete description of the Ph.D. program and course requirements may be obtained by writing the Director of Graduate Studies, Department of Political Science, West Virginia University, Morgantown, WV 26506. This should be done before application to the program. The following constitute the formal minimum requirements of the program:

- Public policy core (24 hours).
- Policy research methods (12 hours).
- Economics (six hours).
- Policy field (12 hours).
- Elective sub-field of specialization (9-12 hours).
- A dissertation in accordance with individual career goals (24-27 hours).
- Passage of comprehensive written and oral examinations.

In order to remain in good standing, students must maintain a 3.0 cumulative average and receive a 3.0 average in each semester for which they are enrolled. Students are required to spend at least one year (two semesters) in residence enrolled in a full-time graduate program of no less than 9 semester hours each semester. All graduate students must enroll in Pol. S. 499 (Colloquium) each semester in residence.

Financial Assistance

The department has a number of assistantships and fellowships available for students in the public policy specialization. Students interested in financial assistance should apply directly to the Department of Political Science. Graduate assistants may enroll for no more than 9 credit hours per semester (excluding colloquium).

Political Science (Pol. S.)

200. *Quantitative Political Analysis.* I, II. 3 hr. PR: Upper-division standing. Course stresses the understanding of methods, theories, and substantive interests identified with behavioral approach to the study of politics. Descriptive statistics and the use of SPSS and SAS are included.
210. *The American Presidency.* I, II. 3 hr. Institutional, behavioral, and societal forces which have given rise to the modern presidency; factors which enhance and constrain the exercise of the presidential power over those constituencies with which the president must interact; the nature and consequences of the presidential decision-making process; desirability and/or feasibility of reforming the presidency.
212. *Judicial Politics.* II. 3 hr. The role of courts and judges in the American political process. Topics include the structure and process of courts, factors involved in judicial decision-making, and the appropriate role of courts in matters of public policy.

213. *American Constitutional Law*. I. 3 hr. The role of the Constitution in the American political system. Topics covered include the political concept of constitutionalism; the role of the Supreme Court in the political process; division of powers among the three branches of government; and the constitutional relation between the national government and the states.

214. *Civil Liberties in the U.S.* I, II. 3 hr. Issues in constitutional law concerning personal liberties against government action. Topics include free speech, press and association; religious freedoms; abortion; the right to privacy; due process of law; and criminal procedure safeguards.

218. *The Legislative Process*. II. 3 hr. Structure and organization of legislative bodies, powers of legislature, detailed study of law-making procedures, influences of outside forces.

221. *West Virginia Government and Administration*. I, II. 3 hr. Organization and operation of the state government of West Virginia.

225. *Urban Politics*. I. 3 hr. Legal basis, structure, processes, and politics of urban governments and cooperative-conflict relations with other governmental units.

226. *Problems of State and Local Government*. I, II. 3 hr. PR: Pol. S. 120 or equiv. Change processes in state and local systems in the context of federalism.

231. *Criminal Law, Policy and Administration*. I, II. 3 hr. Legal and administrative approach to policy issues in crime and punishment. Focuses on the criminal law, court decisions, and implementation of law and policy in the criminal justice field.

232. *Public Opinion and Propaganda*. I, II. 3 hr. The formation, measurement, and impact of public opinion in the American and cross-national contexts.

235. *Civil Rights Policy and Politics*. II. 3 hr. Analysis of the law, politics, and policy related to discrimination in public accommodations, voting, education, housing and employment based on race, gender, national origin, handicapped status and age.

236. *Energy Policy and Politics*. II. 3 hr. An examination of U.S. energy policies and politics, with particular emphasis placed on the development and implementation of energy policies since 1973.

238. *Politics of Environmental Policy*. I. 3 hr. Examines the formulation and evaluation of United States environmental policy.

240. *Public Administration and Social Change*. I, II. 3 hr. PR: Pol. S. 140. The study of government and administrative organization in their relationships to the sources of change—social, cultural, economic, technological, and environmental—in American society.

242. *American Administrative Systems*. I. 3 hr. Analysis of the nature and processes of American public administration (political, legal, economic, and social conditions), including the role of the bureaucracy in a democracy. (Equiv. to Pub. A. 242.)

244. *Administrative Law and Regulation*. II. 3 hr. PR: Pol. S. 140 or consent. The law of public administration, primarily by case method, covering administrative powers and limitations, procedure in administrative adjudication and rule-making, discretion, ultra vires as check on administrators, notice and hearing, administrative penalties, judicial control and administrative liability.

246. *Comparative Public Administration*. II. 3 hr. Theory and practice of public administration in diverse cultures and national political systems.

250. *Government of Japan*. II. 3 hr. Survey of political institutions and governmental process of Japan with special emphasis on the analysis of political problems in the post-war period.

251. *Government of Soviet Union and Eastern Europe.* II. 3 hr. Survey of the political nondemocratic governments of the Soviet Union and its Eastern European satellites, with special reference to the guiding role and development of Marxism-Leninism.

253. *Western Democratic Governments.* I. 3 hr. Examination of the government and politics of selected western democracies. Included are Canada, Great Britain, France, and West Germany.

254. *Government of China.* I. 3 hr. Survey of political institutions and governmental process of Communist China with a special emphasis on the analysis of political problems since 1949.

255. *Governments of Latin America.* I. 3 hr. Comparative study of the major nations of Latin America.

256. *Governments of the Middle East.* II. 3 hr. Governments and political forces of the Middle East.

258. *Politics of Africa.* II. 3 hr. Historical legacies and current political processes of tropical African countries.

261. *International Organization.* II. 3 hr. Agencies created since the close of World War II. Some reference to development of international law and United Nations.

262. *Nuclear War.* I, II. 3 hr. PR: Pol. S. 160 or consent. A study of the current balance of terror and the potential threat of a nuclear war. This course addresses the sociopolitical and technological dimensions of this issue from 1945 to present.

263. *Public International Law.* I. 3 hr. Law governing relations among nations, including development of rules, means of enforcement, and conflicts between theory and practice.

264. *Conduct of American Foreign Relations.* I. 3 hr. Concepts about and factors influencing the formulation and execution of United States foreign relations; analysis of past policies and current issue areas in relations with major developed and developing nations and international organizations.

265. *Politics, Ethics and War.* II. 3 hr. PR: Pol. S. 160 or consent. An examination of the relationship between politics, ethics and war with special reference to nuclear weapons and strategies. Emphasis on the causes of the nuclear dilemma.

266. *Soviet Foreign Policy.* II. 3 hr. Concepts about and factors influencing the formulation and execution of Soviet foreign relations; analysis of past policies and current issue areas in relations with major developed and developing nations and international organizations.

267. *Latin America in International Affairs.* II. 3 hr. Relations of Latin American states among themselves, with the United States, the United Nations, regional organizations, and nonwestern states. Analysis in depth of the Monroe Doctrine and its corollaries and the inter-American system.

268. *International Conflict.* I, II. 3 hr. PR: Pol. S. 160 or consent. Conflict in international relations, particularly armed conflict between nations. The role of force, impact of modern technology and nuclear weaponry, theoretical and research approaches to causes of conflict and modes of conflict resolution.

269. *Far Eastern International Relations.* II. 3 hr. International relations of Far Eastern countries with emphasis on historic roots of recent conflicts, the competitive role of the United States and the Soviet Union, confrontation between the communist and anticommunist countries in the region, and the regional cooperation and security problems in the post-war period.

272. *Recent and Contemporary Political Thought*. I. 3 hr. Examination of integral liberalism and the forces leading to the decline of liberalism and a critical analysis of the fascist and communist ideologies with their threat to the traditions of western civilization embodied in Christianity and conservatism.

273. *American Political Theory*. I. II. 3 hr. Major political ideas and their influence upon American society and government from the seventeenth century to present.

279. *Analysis of Political Behavior*. II. 3 hr. Examines political behavior in terms of recent behavior theories emanating from a variety of disciplines.

299. *Special Topics*. I. II. 1-3 hr.

300. *Introduction to Policy Research*. I. 3 hr. Introduction to the research methods and techniques used in policy analysis. Topics include logic of inquiry, research designs, measurement, and survey and unobtrusive research (3 hr. seminar.)

310. *Intergovernmental Relations*. I. 3 hr. Examination of the politics and policy consequences of intergovernmental relations in the United States. Topics include the development of intergovernmental relations, regulatory federalism, and intergovernmental fiscal relations. (3 hr. seminar.)

330. *Policy Analysis*. I. 3 hr. Overview of the field of public policy studies. The issues and problems involved in studying policymaking, and assessment of policy analysis as a mode of thinking and inquiry. (3 hr. seminar.)

331. *Economic Analysis of Public Policies*. 3 hr. Application of economic analysis to questions of public policy. Consideration of problems of public goods and usefulness of cost benefit analysis to policymaking. (Equiv. to Econ. 343.)

336. *Politics of Agenda Setting*. I. II. 3 hr. Examines the confluence of social, economic, and political influences on the development of public problems and their placement on the policy agenda. (3 hr. seminar.)

345. *Public Administration and Policy Development*. II. 3 hr. PR: Pol. S. 140 or consent. Decision-making and policy development in the administrative process by the case method. (3 hr. seminar.)

351. *Politics of Planned Development*. I. 3 hr. Political aspects of social, economic, and technological change, with special reference to the politics of development planning and administration. (3 hr. seminar.)

355. *Comparative Public Policy*. I. II. 3 hr. Comparison of public policy outputs in several western European countries and Japan with emphasis on the analysis of variables that account for variations in distributive, regulative, and extractive policies. (3 hr. seminar.)

360. *International Public Policy Analysis*. II. 3 hr. Provides a bridge between the conventional study of international relations and the analysis of externally directed public policy. Introduces the graduate student to specific policy areas such as international trade, aid, resources, and security policy. (3 hr. seminar.)

400. *Quantitative Methods for Policy Analysis*. II. 3 hr. PR: Pol. S. 300 and Stat. 311, or equivalents. Application of range of statistical techniques in public policy research. Includes use of selected computer software commonly used in policy analysis.

401. *Advanced Quantitative Methods*. I. 3 hr. PR: Pol. S. 400 or equivalent. Advanced topics in quantitative methods for policy research. Methods surveyed include multiple linear regression, time-series analysis, causal modeling and linear programming.

403. *Internship*. I. II. 6-9 hr. per sem.; students may enroll more than once. PR: Consent.

429. Seminar in State and Local Government. I, II. 3 hr. PR: Consent.

430. Seminar: American Policy Process. I. 3 hr. A survey of the literature which deals with how various institutions and linkage mechanisms in U.S. politics affect the public policy process. (3 hr. seminar.)

435. Public Policy Evaluation Research. II. 3 hr. Methods and techniques in evaluating public policies. Topics include the relation of policy analysis to policymaking; types of evaluation; planning evaluations; alternative evaluation designs; measuring program consequences; problems of utilization; and the setting of evaluation research. (3 hr. seminar.)

438. Seminar in Public Policy Implementation. II. 3 hr. Research seminar focusing on factors influencing the capacity of government to deliver services. Includes an examination of how socio-economic conditions, technology, public opinion, interest groups, institutional actors, and decision-making variables influence policy outcomes. (3 hr. seminar.)

439. Seminar in Policy Analysis. I, II. 3 hr. PR: Pol. S. 335 or consent. This course requires students to conduct an original piece of quantitative policy research. Designed for advanced students, the course is taken following the completion of the department's research methods sequence. (3 hr. seminar.)

441. Directed Reading and Research in Public Administration. I, II. 2-4 hr. per sem.; students may enroll more than once. PR: Pol. S. 140 or consent.

480. Thesis. I, II. 2-6 hr.

491. Advanced Study. I, II. 1-6 hr. PR: Consent.

497. Research. 1-15 hr.

499. Colloquium. I, II. 1-6 hr.

PSYCHOLOGY

Barry A. Edelstein, Chairperson of the Department

301-C Oglebay Hall

Degrees Offered: Master of Arts

Doctor of Philosophy

Graduate Faculty: Members Alavosius, Bradlyn, Caldwell, Chase, Cohen, Cummings, Edelstein, Foster, Franzen, Fremouw, Goetsch, Goodman, Greene, Hansen, Harris, Hawkins, Karraker, Larkin, Lattal, Odom, Parker, Perone, Puckett, Reese, and Seime. Associate Members Carruth, Comer, and Linton.

Admission. Students are admitted only at the beginning of the fall semester. Application must be completed by the preceding February 1. Acceptance is based on: adequate academic aptitude at the graduate level as measured by the Graduate Record Examination; a minimum grade-point average of 3.0; personal qualities in the applicant which are predictive of success in graduate study and satisfactory professional placement after graduation; and adequate preparation in the biological and social sciences, experimental psychology, and statistics. By permission, deficiencies in preparation may be made up after admission to the department. Students are expected to maintain a 3.0 average in their psychology courses during the first graduate year and to present a final 3.0 average in all psychology courses attempted.

Special Graduate Students. Graduate courses in psychology are open only to regular graduate students except by special departmental permission.

Master of Arts. Two years of full-time study with a minimum of 48 hours of credit are required for the M.A. degree. Six hours of credit may be counted

for the M.A. thesis if such thesis is required by the option chosen by the student. The following options are available for the M.A. degree:

1. Intermediate Degree for Ph.D. Candidates. Students who are candidates for the Ph.D. are expected to complete an M.A. thesis and will receive the M.A. degree upon completing the thesis and credit-hour requirements.

2. Professional M.A. Degree in Clinical Psychology. This program prepares the student for work in community mental health centers, medical facilities, mental health and mental retardation institutions, and school systems. A six month, full-time internship is required, and a thesis is optional.

Doctor of Philosophy. The doctoral programs aim to prepare a small number of well-qualified psychologists for three types of careers: (1) teaching and research in behavior analysis; (2) teaching and research in lifespan developmental psychology; and (3) teaching, research, and practice in clinical psychology. A calendar year in an approved internship setting is required of all clinical students.

Students are accepted for study toward the Ph.D. degree upon entry into the department. They are formally admitted to doctoral study only after completion of the master's degree or its equivalent and may be subject to a screening examination to determine their readiness for doctoral work. Prior to admission to doctoral candidacy, the student will be admitted to a comprehensive preliminary examination in which competence must be demonstrated in the major area of specialization and a knowledge of such other areas of psychology as may be required of all graduate psychology students.

Upon passing the preliminary examination, the student is formally promoted to candidacy for the doctorate. For those students required to complete an internship as a part of their training, the internship setting must be approved by the appropriate program committee. In the clinical psychology programs, the internship must be approved by the program and by the Director of Clinical Training.

After completion of a satisfactory dissertation and all other requirements, the candidate takes a final examination, written or oral, concerning the major emphasis and the dissertation.

Psychology (Psych.)

213. *Directed Studies. I, II, S. 1-3 hr. PR: Consent. (No more than 12 hours may be applied to the 42 hours of psychology to which majors are limited.)* Individually supervised reading, research and/or classroom management projects.
218. *History and Systems of Psychology. II. 3 hr. PR: 15 hr. of psychology or consent. A survey of psychology from its origins in philosophy, biology, and physics through the several major schools of psychological thought to modern perspectives of behavior.*
223. *Cognition and Memory. I. 3 hr. PR: 9 hr. of psychology. Theoretical and empirical issues in human learning and memory with emphasis on mechanisms of memory, language, verbal behavior, and conceptual processes.*
224. *Conditioning and Learning. I, II. 3 hr. PR: Psych. 171. Survey of research in operant conditioning and its implications for behavior theory and applications.*
225. *Perception. I, II. 3 hr. PR: Psych. 131, 141. A survey of the structure and function of human sensory systems (primarily visual and auditory) and perceptual issues and theories.*
232. *Physiological Psychology. I. 3 hr. PR: Psych. 131. Introduction to the physiological mechanisms of behavior.*

242. *Prenatal and Infant Behavior*. I. 3 hr. PR: Psych. 131. Early influences upon behavior and development are investigated; topics include behavioral genetics, hazards of prenatal development, sensorimotor development, language development, and socioemotional development.

243. *Child and Adolescent Behavior*. II. 3 hr. PR: Psych. 141. Theory and research on major psychological processes in childhood and adolescence are explored including maturation, personality, socialization, sensory, and cognitive development.

245. *Adulthood and Aging*. I. 3 hr. PR: Psych. 141. Cognitive and personality changes from maturity to old age. Psychological reactions to physiological change and to the establishment and dissolution of family units. Problems of intergenerational differences in adult behavior.

251. *Social Psychology*. II. 3 hr. PR: Psych. 151. Social factors which determine human behavior. Survey of the results of laboratory research in social psychology and its implications for social phenomena.

262. *Psychological Assessment*. II. 3 hr. PR: 9 hr. of psychology. Theory and practice in development and use of psychological assessment procedures. Includes intelligence testing, behavioral assessment, and interviewing.

263. *Comparative Personality Theory*. I, II. 3 hr. PR: 9 hr. of psychology or graduate standing. Theoretical and empirical readings in a survey of major perspectives in personality theory, including dynamic, cognitive, humanistic, and behavioral theories of personality.

264. *Psychology of Adjustment*. II. 3 hr. PR: 9 hr. of psychology or graduate standing. Dynamic principles of human personality adjustment.

274. *Survey of Behavior Modification*. I, II. 3 hr. PR: Psych. 171. Behavior therapy and modification including desensitization, covert sensitization, interpersonal skill training, aversion techniques, and applied behavior analysis employing operant principles.

279. *Community Psychology*. I. 3 hr. PR: Psych. 151. Psychological principles applied to treatment and intervention strategies at the community level. Manpower development, organizational change, and systems analysis.

281. *Abnormal Psychology*. I, II. 3 hr. PR: 9 hr. of psychology or graduate standing. Major categories of behavioral disorders, e.g., neuroses, psychoses, and character disorders are considered in terms of etiology, treatment, outcome, and prevention.

282. *Exceptional Children*. I, II. 3 hr. PR: Psych. 141. Study of children who present psychological problems: (1) mental retardation, learning disabilities, "giftedness"; (2) organic disabilities having behavioral consequences, such as cerebral palsy or deafness; and (3) behavior disorders.

297. *Honors Investigation and Thesis*. I, II. 3 hr. (May be repeated for credit; max. credit 6 hr.) PR: Admission to Honors Program in Psychology. Supervised readings and investigation culminating in the honors thesis.

311. *Research Design and Data Analysis 1*. I. 3 hr. Principles of experimental design in psychology including group and single subject methodologies. Topics include: (1) internal and external validity; (2) simple and complex analysis of variance; and (3) reversal and multiple baseline designs.

312. *Research Design and Data Analysis 2*. II. 3 hr. PR: Psych. 311 or consent. Inferential statistics, simple correlation and regression, multiple correlation and regression, partial correlation, analysis of covariance, analysis of variance of designs with unequal cell sizes.

313. *Directed Study*. I, II, S. 1-3 hr. per sem. PR: Consent. Directed reading and research in special areas. (Undergraduates register for such projects under Psych. 213.)

315. *Multivariate Analysis*. I or II. 3 hr. PR: Psych. 311, or equiv., and consent. Correlational methods in psychology with application to typical research problems. Includes simple matrix algebra, multiple correlation, discriminant analysis, and an introduction to factor analysis. (Equiv. to Stat. 341.)

316. *Correlational and Quasi-Experimental Designs*. I. (Alternate Years.) 3 hr. PR: Psych. 311 and 312 or equiv. Consideration of the methods, measurement, and analysis of nonexperimental research. Includes survey, correlational, and quasi-experimental designs; questionnaire and attitude scale construction; nonreactive measurement techniques; and data analysis.

318. *Ethical and Legal Issues*. II. 2 hr. The ethical standards for psychologists are applied to research and clinical problems. The legal regulations and contemporary issues in mental health are studied.

319. *Professional Issues in Behavior Analysis*. 1 hr. PR: Graduate standing in psychology; consent. Survey of professional issues in general psychology as they relate to a behavior analysis approach.

320. *Experimental Analysis of Behavior*. I. 3 hr. PR: Graduate standing in psychology or consent. Research and theory in the psychology of learning. Assessment of traditional and behavior analytic approaches to the study of positive reinforcement, aversive control, and stimulus control. Laboratory work with animals.

321. *Human Behavior*. I. 3 hr. PR: Psych. 320. Review of the role of basic human operant research in testing the generality of animal-based behavior principles, analyzing phenomena that are specific to humans, extending behavior analysis to traditional psychological problems.

323. *Applied Behavioral Research*. II. 3 hr. PR: Psych. 320. An examination of conceptual and empirical issues in applied behavior analysis as illustrated by recent research. The continuum from laboratory to applied research is emphasized.

324. *Organizational Behavior Management*. I. 3 hr. PR: Psych. 320 and 323 or consent. Introduction and comparison of behavioral and systems concepts, methods and models as they apply to organizations, administration, and human service management.

333. *Seminar: Quality of Work Life*. II. 3 hr. PR: Consent. Analysis of current trends and approaches in "quality of work life improvement," with special attention to developments in participative management, job enrichment and gain sharing. Results of current research are featured. (Equiv. to ILR 333.)

340. *Advanced Developmental Issues and Methodology*. II. (Alternate Years.) 3 hr. Developmental issues including historical perspectives, validity, theoretical systems, and growth models are presented along with research methods and designs employed in life-span developmental psychology.

344. *Infant Behavior and Development*. I. (Alternate Years.) 3 hr. Examination of theories of infancy and evaluation of current research literature in the areas of cognitive, perceptual, language, and social development. Prenatal and neonatal development are emphasized. Related social issues will be discussed.

345. *Child Behavior and Development*. II. (Alternate Years.) 3 hr. Examination of the psychological literature on developmental changes in such areas as learning, cognition, language, social relations, and personality during early, mid and late childhood. Experimental research and theory are emphasized and implications for life-span development are discussed.

346. *Adulthood and Aging*. I. (Alternate Years.) 3 hr. Comparative theories of life-span development; current issues in research on adulthood and aging, including personality and socialization, age norms, biological change in adulthood and aging.

352. *Community Psychology*. I. (Alternate Years.) 3 hr. Psychological principles and research findings at the community level are applied to various types of intervention strategies. Manpower utilization, needs assessment, the community mental health movement, complex organization theory and behavioral systems analysis are included.

364. *Child Behavior Modification*. II. 3 hr. Assessment, intervention, and evaluation strategies appropriate for childhood disorders and based on behavior modification principles derived from learning theory.

375. *Fundamentals of Gerontology*. II. 3 hr. PR: MDS 50 or consent. An advanced multidisciplinary examination of current research in biological, psychological, and sociological issues of human aging and the ways in which these impinge on the individual to create both problems and new opportunities. (Also listed as Biol. 375.)

379. *Introduction to Clinical Psychology*. I. 2 hr. PR: Graduate student in psychology or consent. Basic interviewing skills and current problems in the practice of clinical psychology.

380. *Adolescence and Young Adulthood*. I. (Alternate Years.) 3 hr. Examination of psychological, psychiatric, and sociological research and theory as they pertain to these phases of the life span. Addresses socioemotional and affective development, cognition, puberty, peer group and familial relationships, labor force entry, and parenthood.

381. *Behavior Pathology*. II. 3 hr. PR: Psych. 281 or equiv. Advanced study of diagnostic classification, functional analysis, and experimental research in psychopathology of child, adult, and geriatric adjustment problems.

397. *Master's Thesis*. I and II. 1-6 hr. PR: Consent.

411. *Advanced Topics in Single-Subject Research*. II. (Alternate Years.) 3 hr. PR: Psych. 311 and 320. Critical evaluation of single-subject designs in basic and applied research. Major topics include historical and conceptual bases of single-subject methodology's historical and conceptual bases, its relationship to group-statistical methods, and its role in behavioristic psychology.

417. *Research Issues in Behavior Analysis*. (Alternate Years.) 3 hr. (May be repeated for credit with consent.) PR: Consent. Examination of research issues in general psychology as approached from a behavior analytic perspective. Specific topics vary from year to year.

419. *Seminar Methodology*. I or II. 2 hr. per sem. PR: Consent. Current problems in statistics and research or instructional methods.

420. *Reinforcement and Punishment*. II. (Alternate Years.) 3 hr. PR: Psych. 325, 326. Theories of response acquisition, maintenance, and suppression are examined in the context of recent experimental work with animal subjects.

421. *Behavior Theory and Philosophy*. I. (Alternate Years.) 3 hr. PR: Psych. 325, 326 or equiv. A critical review of theories, concepts, and methods of psychology. Cognitive and methodological behavior perspectives are contrasted with the radical behavioral perspective.

423. *Practicum Seminar in Behavior Analysis*. II. 3 hr. PR: Psych. 323 and Psych. 324 or consent. Supervised applied behavior analysis experience integrated with a seminar which will emphasize group solutions to problems that individuals encounter in students' applied projects. Progress and final project reports will be presented and evaluated. (1 hr. seminar; 2 hr. practicum.)

424. *Social Behavior*. I. (Alternate Years.) 3 hr. A learning approach to social psychology that will include both basic and applied problem areas. The area of social exchange such as cooperation, competition, and negotiation will be emphasized.

425. *History and Systems.* I. (Alternate Years.) 3 hr. The history of psychology is traced from European philosophy to the emergence of psychology in the United States. Emphasis is placed on the development of psychology in the United States leading to current theory and research.

426. *Stimulus Control and Memory.* II. (Alternate Years.) 3 hr. PR: Psych. 325 or consent. Contemporary review of basic research in stimulus control and memory emphasizing behavior theory.

427. *Behavior Analysis Practicum.* I, II, S. 1-6 hr. PR: Psych. 318 or consent. Supervised applied behavior analysis experience in an approved setting.

428. *Seminar in Behavior Analysis.* II. 3 hr. (May be repeated for credit with consent.) PR: Consent. Current research and problem areas in the learning approach to behavior analysis. The topic of a given seminar may be either a basic research or an applied research problem area.

436. *Seminar in Learning and Cognition.* II. (Alternate Years.) 3 hr. (May be repeated for credit with consent.) PR: Consent. Topical seminar on developmental aspects of learning and cognition. Specific topic examples include the role of imagery in learning and memory; theoretical analyses of age changes in discriminative learning and transfer; rules and rule-governed behavior.

437. *Practicum in Developmental Psychology.* I, II, S. 1-6 hr. PR: Consent. Provides experience in a wide range of applied settings. Sites are chosen to accommodate exposure to the entire life-span from infancy through old age. Supervising responsibilities are determined by the instructor-in-charge in the agency.

438. *Seminar: Early Development.* II. 3 hr. (May be repeated for credit with consent.) PR: Consent. Developmental processes during early childhood are explored with emphasis on theoretical models, methodological and research issues, and experimental design. The specific topic depends on the instructor.

442. *Topical Seminar: Life-Span Development.* I, II. 1-3 hr. (May be repeated for credit with consent.) PR: Consent. Topical seminar exploring a particular period of the life span, e.g., adolescence, or perspectives on the life span, e.g., cross-cultural perspectives on the life cycle.

443. *Topical Seminar: Personality and Socialization.* II. 3 hr. (May be repeated for credit with consent.) PR: Consent. Topical seminar on current issues in personality and socialization over the life-span or during selected periods of the life span.

451. *Clinical Service Management.* I. (Alternate Years.) 3 hr. PR: Psych. 350 or consent. (Specifically designed for doctoral students in psychology.) An overview of research and intervention strategies in administration and management of complex human service organizations from a behavioral psychology perspective.

453. *Systems Intervention and Consultation.* II. (Alternate Years.) 3 hr. PR: Psych. 350 or consent. (Specifically designed for doctoral students in psychology.) Consulting in complex organizations such as industry, community mental health centers, mental hospitals, facilities for the retarded, etc. Systems entry and maintenance are stressed as well as complex organizational theory and behavioral systems analysis.

456. *Program Evaluation in Clinical Services.* II. (Alternate Years.) 3 hr. (Specifically designed for doctoral students in psychology.) Examines the nature, method, and process of evaluative research, especially as it applies to social and behavioral treatment and service delivery programs.

457. *Systems Practicum in Clinical Services.* I, II, S. 1-6 hr. PR: Consent. (Specifically designed for doctoral students in psychology.) Supervised experience in the application of behavioral systems analysis and intervention in complex organizational settings.

464. *Family and Marital Therapy*. II. (Alternate Years.) 3 hr. PR: Clinical experience and/or relevant course practica; graduate standing; at least one upper-division course in behavior therapy or equivalent. Examines both theoretical and practical aspects of the assessment and treatment of family and marital difficulties.

467. *Child Clinical Practicum*. I, II, S. 1-6 hr. PR: Consent. Supervised field experience in various aspects of delivering psychological services directly or indirectly to children. Experience in assessment, treatment, program design, administration, and evaluation.

468. *Seminar in Child Clinical Psychology*. II. (Alternate Years.) 3 hr. Current issues and research related to a particular area of clinical psychology involving children.

470. *Behavioral Assessment 1*. I. 3 hr. Conceptual and methodological bases for behavioral assessment; comparison of trait-oriented versus behavioral assessment; design and evaluation of measurement systems, particularly self-report, ratings by others, and direct observation, within the basic framework of generalizability theory.

471. *Behavioral Assessment 2*. II. 3 hr. PR: Psych. 470, consent. Evaluation of clinically relevant behavior and environments by means of testing and other methods. Includes test selection, administration, and report writing.

477. *Clinical Psychology Practicum*. I and II. 1-6 hr. per sem. PR: Consent. Supervised practice of psychological techniques in clinics or institutional settings. Experience in psychological testing, interviewing, report writing, case presentation, interpretation of tests and supportive counseling.

479. *Seminar: Clinical*. I or II. 2 hr. PR: Consent. Research and problems in clinical psychology.

480. *Clinical Neuropsychology*. II. 1-4 hr. Neuroanatomical foundations, neurobehavioral disorders, neuropsychological assessments, and psychopharmacological principles and practices relevant to clinical psychology.

481. *Psychophysiology*. II. (Alternative Years.) 3 hr. PR: 3 hr. of physiological psychology or consent. The current state of theory, methods, and findings concerning the association of physiological response systems and psychological states and processes, including biofeedback intervention.

482. *Adult Behavior Therapy*. II. 3 hr. Reviews the roots and development of behavioral intervention with adult populations. Applied clinical intervention is stressed in concert with evaluation and research application.

490. *Teaching Practicum*. I and II. 1-3 hr. per sem. PR: Consent. Supervised practice in college teaching of psychology.

497. *Research. (Dissertation)*. I and II. 1-15 hr. per sem. PR: Consent.

PUBLIC ADMINISTRATION

David G. Williams, Chairperson of the Department
302-B Woodburn Hall

Degree Offered: Master of Public Administration

Graduate Faculty: Members Klase, Mok, Pops, Williams, and Wolf.

The Department of Public Administration offers a public administration curriculum for graduate students seeking the degree of Master of Public Administration (M.P.A.) or a specialization in the field of another graduate degree program. This program provides a professional orientation to the primary facets of public management.

Master of Public Administration (M.P.A.)

The Master of Public Administration curriculum serves the needs of students from a variety of backgrounds who wish to pursue careers in public service. It directs particular attention to developing an understanding of the management function in the public context as well as preparation in utilizing advanced management techniques. The study program furnishes the student with opportunities to attain comprehensive understanding of governmental policymaking and policy execution. The processes of administration are reviewed in terms of their relationship with, and applicability to, the functioning of government at all levels.

The program is designed to supply an academic foundation for comprehension of the range of processes and management approaches employed in public administration. These include program planning, personnel administration, budgetary policy-making and policy execution, systems approaches, organizational dynamics, practically oriented research, and leadership. Particular stress is placed on those functions and issues that require the greatest degree of adaptation, innovation, and responsiveness on the part of the professional administrator.

The curriculum reflects the diversity of skills required by all levels of government. The range of needs is broad in scope; students apply from diverse backgrounds, including political science, other social sciences, physical sciences, humanities, and from positions in public service.

Curriculum. The M.P.A. degree requires the completion of 47 credit hours. This includes:

1. Public administration courses in core areas such as administrative organization and management, public personnel management, legal and political foundations, public budget formulation and execution, public financial management, quantitative analysis (Pol. S. 200), and applied research.
2. Two semesters of colloquium (guest speakers and special presentations).
3. Intern experience.
4. Selections from a wide range of specialized public administration courses and elective courses offered in other fields.

Most students take 20 hours of required courses and colloquium, 9 hours internship, and 15 hours from the specialized public administration and elective courses. These general requirements can be tailored to individual student needs with revisions agreed upon by both the student and adviser.

It will usually take the equivalent of one calendar year for full-time students to complete on-campus requirements. In addition, the off-campus internship will generally be one semester in length and may be taken after part of the course work is completed. For those individuals who have been in full-time public service positions, projects relating directly to that work experience can be designed for internship credit.

Tool Requirement. While tool skills are included in the required courses, it is strongly recommended that students take courses in accounting, statistics, and computer science as part of their undergraduate program. Course work may also be taken at the graduate level in these subjects (200 and above) and counted as elective hours.

Admission Requirements. Candidates must meet the WVU general admission requirements for graduation from an accredited college and grade-

point average. Admission into the M.P.A. program is competitive with decisions based on:

1. Application for admission and transcripts (submitted to the Dean of Admissions and Records).

2. Three letters of evaluation (forms are available from the chairperson of the Department of Public Administration), Graduate Record Examination scores for the aptitude test, a vita, any other information that would be supportive, and interviews, where possible. (These materials should be submitted to the chairperson of the Department of Public Administration.)

In the case of practicing administrators, a record of accomplishment in administrative performance will be weighed heavily in combination with the criteria outlined above.

Students applying for first semester or summer admission should have all application materials submitted no later than March 15. Notification on admission status will take place around April 1. Students applying for the Second Semester should have all application materials completed by October 15; notification is given around November 1. Late applications for admission will be considered when all the above requirements are met, assuming that openings in the program are available.

Application forms and information may be obtained by contacting the chairperson of the Department of Public Administration.

Public Administration (Pub. A.)

242. *American Administrative Systems.* S. 3 hr. Analysis of the nature and processes of American public administration (political, legal, economic, and social conditions), including the role of the bureaucracy in a democracy.) (Equiv. to Pol. S. 242.)

341. *Administrative Organization and Management.* I, II, S. 3 hr. Introduction to public administrative organization and such management functions as leadership, planning, coordination, communication, and decision-making.

343. *Public Personnel Administration.* I, II. 3 hr. Merit system concept, career staffing, classification and salary administration, selection, evaluation, manpower utilization, training, the rights and duties of employees, equal employment, and labor relations in the public sector.

345. *Public Administration and Policy Development.* I. 3 hr. Policy development examined in terms of values, process, specific policy cases, alternative "futures" analyses and policy science.

348. *Legal and Political Foundations.* I, II. 3 hr. Explores the constitutional basis of public administration, the legal profession and legal reasoning, U.S. political processes and structure, and administrative legal process; provides training in legal research and advocacy; examines administrative legal responsibility.

403. *Internship.* I, II, S. 3-9 hr. (Students may not enroll more than twice for a total of 9 hr.) PR: Consent; completion of at least one term of graduate study in public administration. A working internship in a government or public service related agency, designed to provide students with an opportunity to gain field experience, and to relate knowledge gained through course work situation. (Graded S or U.)

404. *Public Service Internship Analysis.* I, II, S. 3 hr. PR: Completion of at least one term of graduate study in public administration and registration in Pub. A. 403. Designed for students enrolled in Pub. A. 403. Students undertake in-depth analysis of elements of their internship (policy matters, organizational questions, administrative dilemmas, etc.), and prepare a written report.

439. *Administrative Justice*. S. 3 hr. Analysis of concepts of justice in public administration. The focus is upon conflict between systems of individual and social justice, personal ethics in government, and the control of administrative discretion.

440. *Readings and Research—Public Administration*. I, II, S. 1-3 hr. (Students may enroll more than once.) PR: Consent. Designed to give specialized coverage to particular areas of public administration for advanced students.

443. *Public Employee Labor Relations*. I, S. 3 hr. PR: Consent. Provides overview of theory, structures, and issues of public-sector labor relations; specific knowledge and training in processes and behaviors of contract negotiation and contract maintenance; and introduction to conflict management in nonunionized settings.

444. *Public Program Planning*. II. 3 hr. Focuses on planning as a determinant of system direction, operation, and performance. The course is designed both to survey and make various applications of program planning and systems concepts in public administration.

445. *Public Budget Formulation and Execution*. I, II, S. 3 hr. Emphasizes concepts of budgeting and budgetary applications at the federal, state, and local levels of government. The case method is utilized to cover objectives, performance criteria, output measures, and technical procedures.

446. *Public Financial Management*. I, II. 3 hr. PR: Graduate standing. Examines financial administration in the public sector with particular attention to revenue systems, treasury and debt management, financial controls and intergovernmental fiscal relations. Public policy implications are developed.

447. *Applied Research in Public Administration*. I, II. 3 hr. PR: Pol. S. 200 and consent. The student will complete a major field research project. Each project includes research design, data collection and analysis, and comprehensive final report.

450. *Administrative Behavior in Public Organizations*. II, S. 3 hr. PR: Consent. Introduces and familiarizes the student with the nature of individual and group behavior in public organizations and bureaucratic settings.

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Focuses on those subjects of most topical concern in public administration.

499. *Colloquium*. I, II. 1 hr. PR: Limited to M.P.A. students. A series of selected speakers and presentations on a wide range of topics related to public administration and public affairs. (Graded S or U.)

READING

607 Allen Hall

Degree Offered: Master of Arts

Graduate Faculty: Members Barksdale, Rinehart, Saltz, and P. Smith. Associate Member Hobbs.

The Division of Education provides opportunities for graduate study and research leading to the master of arts for educators and other professionals with educational responsibilities. The primary purpose of the master's program in reading is to provide increased knowledge, skill, and competence for teachers or those who work in the field. The program contains a number of related options for emphasis within its framework, making it flexible enough to meet a wide variety of needs.

Options are planned by the student, the student's adviser, and the student's graduate committee to fit the student's career plans. In addition to the general requirements of the University and the College of Human

Resources and Education, the department requires a core of courses or course areas and supporting competencies.

All applicants must comply with the general WVU requirements, and requirements of the College of Human Resources and Education and the Reading Program.

Graduate students with successful teaching experience at the elementary, secondary, or college levels, or those who desire to enter these fields, may wish to increase their competence as teachers of reading, to keep informed of latest trends and developments in reading education, or to prepare for positions of greater responsibility.

Course offerings provide opportunities to become familiar with the organization, implementation, and administration of developmental and remedial reading programs at the elementary, secondary, and college levels. Advanced students of superior academic and professional background have opportunities to participate in clinical work and to become involved in research.

Option tracks for the doctor of education degree and the certificate of advanced study are worked out individually with each student. Course requirements depend upon previous academic background and experience and the position for which the student wishes to prepare. Practical training for teachers and specialists-in-training is provided by the Reading Clinic.

For further information on admission and program, write, Chairperson of Graduate Programs, Division of Education, College of Human Resources and Education, 604 Allen Hall, P.O. Box 6122, Morgantown, WV 26506-6122.

Master of Arts in Reading

Special Program Requirements

1. Students must complete six or more hours in reading within two years after admission (probationary or regular) or admission will be invalidated and the student will be required to reapply.

2. Program A—Completion of a minimum of 36 hours including the completion of a problem or thesis.

3. Program B—Completion of a minimum of 36 hours of course work.

4. Successful completion of a written final examination.

Course Requirements

The course requirements in Program A and B lead to reading specialist certification. Electives should be decided in conference with adviser.

A. Required Courses

		Hours	
	Program	A	B
Rdng. 321		3	3
Rdng. 322		3	3
Rdng. 324		3	3
Rdng. 326		3	3
Rdng. 327		3	3
Rdng. 340		3	3
Rdng. 341		3	3
Rdng. 495		6	0
C&l 301 or 304 or 307		0	3
Ed. P. 330 or Rdng. 380/Measurement/Evaluation in Lang. Arts		3	3
Ed. P. 300 or 450 or 451 or Psych. 263 or 264 or 281		3	3
Sp. Ed. 250 or Psych. 282		3	3
		36	33
B. Electives		0	3
Total		36	36

Reading (Rdng.)

- 221. *Developmental Reading*. I, II. 3 hr. PR: Consent. Fundamentals of reading instruction. Emphasizes classroom organization and teaching techniques.
- 222. *Reading in the Content Areas*. I, II. 2 hr. Skills and strategies needed by content area teachers to reinforce the reading skills necessary for the effective learning of secondary students in the content areas.
- 240. *Corrective Language Arts Techniques*. I, II. 3 hr. PR: Rdng. 221, consent. Fundamentals of informal language arts diagnosis and corrective classroom language arts instruction. A practicum for the utilization of informal diagnosis and correction techniques is provided.
- 283. *Special Workshop in Reading*. I, II, S. 1-6 hr. For elementary and secondary students in preservice education programs, as well as for elementary and secondary teachers in inservice education.
- 321. *Reading Instruction in Elementary Schools*. I, II, S. 3 hr. Gives students who have little or no background in reading an opportunity to study the reading process and to learn how to apply effective techniques and methods at the elementary school level. Grades K-6.
- 322. *Reading Instruction in Secondary Schools*. I, II, S. 3 hr. The reading skills essential at the secondary level and how they may be developed in the various subject-matter areas.
- 323. *Reading and Early Childhood Education*. I, II, S. 3 hr. Development of a reading-language program for young children that includes consideration of: (1) the nature of the beginning reading process; and (2) the nature of children's cognitive, perceptual, linguistic, psychological, physical, and social growth.
- 324. *Foundations of Reading Instruction*. I, II, S. 3 hr. The physiological, psychological, sociological, and historical foundations underlying the development of reading proficiency. For majors in education, reading, counseling and guidance, special education, speech communication, and other areas requiring an understanding of the reading process.
- 325. *Survey of Major Problems in Reading*. II, S. 3 hr. PR: Rdng. 321 or 322 and 324. A research course in which each student will complete an individual problem in an area of special interest.
- 326. *Reading Leadership Skills*. I, II, S. 3 hr. PR: 18 hr. of M.A. requirements. Roles, responsibilities, and practices of reading specialists and administrators in organizing reading programs from early childhood through college.
- 327. *Developing Reading Interests*. I, II, S. 3 hr. Emphasis on methods and techniques for developing reading habits, interests, and tastes and on motivating individuals to read. Special attention is given to integrating the use of children's literature with creative oral and written language.
- 330. *Teaching the Language Arts*. II, S. 3 hr. The interrelationship of the different phases of the language arts. Special attention to organizing the language arts program, selecting materials and equipment, and understanding effective techniques and methods for teaching listening, oral language, written language, handwriting, and spelling.
- 331. *Selection and Evaluation of Reading Materials*. I, S. 3 hr. PR: Rdng. 321. Survey of critical reading skills, techniques, and procedures with emphasis on the selection of supplementary materials needed for effective development and remedial reading programs.

332. *Survey of Major Problems in the Language Arts.* II, S. 3 hr. PR: Rdng. 330 or consent. An advanced course covering major problems of the teacher or supervisor of language arts instruction. A research course in which the student completes an individual problem.

340. *Diagnostic and Prescriptive Reading Instruction.* I, II, S. 3 hr. PR: 6 hr. of Rdng. 321, 324 or 322. Course designed to develop and implement theoretical concepts in the diagnosis and prescription of language problems. Emphasis on techniques utilized by classroom and special teachers of reading and language arts.

341. *Problems in Clinical Reading.* I, II, S. 3 hr. PR: Rdng. 340. Laboratory course in remedial reading. Major emphasis on tutoring remedial cases in the Reading Center.

342. *Reading Diagnosis and Prescription in Learning Disabilities.* I, II, S. 3 hr. PR: Consent. Basic course in diagnostic and prescriptive reading techniques and procedures for learning disability majors. Special emphasis on practicum experiences in administering and interpreting reading tests, as well as prescribing and administering remediation suggestions.

380. *Seminar.* I, II, S. 1-6 hr. PR: Consent. Seminar for master's degree students stressing special topics concerned with the education and sociological and psychological aspects of language arts instruction.

381. *Special Topics.* I, II, S. 1-6 hr. PR: Consent. Special topics or research in reading and language arts for master's degree students in reading.

385. *Practicum.* I, II, S. 1-12 hr. PR: Consent. Practicum type course for master's degree student teaching, and reading administration and supervision practicum experience can be pursued.

442. *Diagnosis of Reading Difficulties.* I, S. 3 hr. PR: Rdng. 340. Advanced instruction in diagnosis. Emphasis on use of standardization tests, informal tests, machines, and observation in determining reading difficulties.

443. *Correction of Reading Difficulties.* II, S. 3 hr. PR: Rdng. 442 or consent. Advanced instruction correcting reading difficulties. Emphasis on methods of teaching, use of machines and commercial materials, constructing and using teacher-made exercises, and evaluating progress.

444. *Advanced Clinical Reading.* I, II, S. 3 hr. PR: Rdng. 341. Laboratory course in remedial reading. Emphasis on diagnosis and treatment of reading difficulties.

480. *Seminar.* I, II, S. 1-6 hr. PR: Consent. The interrelationships among the language arts: mental, physical, and psychological deterrents to language arts; and similar topics.

481. *Special Topics.* I, II, S. 1-6 hr. PR: Admission to doctoral program in reading and consent. Advanced seminar. Weaknesses and strengths in current reading programs, needed research in reading, and suggestions for improving reading instruction at elementary, secondary, and college levels.

485. *Practicum.* I, II, S. 1-12 hr. PR: Consent. Practical application of reading theory to organizing and conducting developmental and remedial reading programs.

495. *Problem in Reading.* I, II, S. 3 hr. Research for master's degree in reading.

RECREATION AND PARKS MANAGEMENT

Jack E. Coster, Chairperson of Division of Forestry
322-A Percival Hall

Harry V. Wiant, Jr., Coordinator of the Graduate Program

Degree Offered: Master of Science

Graduate Faculty: Members E. C. Bammel, L. L. Bammel, and Hollenhorst. Associate Members Hummel-Azzaro and Hutchison.

Master of Science (M.S.)

The Division of Forestry of the College of Agriculture and Forestry offers programs leading to the master of science for students who wish to major in recreation and parks management fields.

Graduate program options include but are not limited to: recreation administration and policy, environmental education and interpretation, and recreation planning and resource management. Admission requirements are those of the College of Agriculture and Forestry. Degree requirements are either 30 semester hours of approved study, including a six credit-hour thesis, or 36 hours without a thesis but with a three credit-hour problem paper. These programs ordinarily require two years of residence.

Recreation and Parks (Rc. & Pk.)

202. *Recreation Internship.* I. 3 hr. PR: Rc. & Pk. 43, 44, 251/263, 233/235/271. Supervised, full-time leadership responsibility with a recreation agency for a minimum of eight weeks. Program must relate to the student's curriculum option and must be approved in advance by the internship program coordinator.
203. *Professional Synthesis.* I, II. 3 hr. PR or Conc.: Rc. & Pk. 202. A capstone course for seniors that involves the synthesizing of professional training and field work experiences.
216. *Philosophy of Recreation.* II. 3 hr. PR: Consent. Interpretation of recreation as a basic part of the living process; importance to individual community and national welfare; social and economic significance.
226. *Leisure and Aging.* 3 hr. PR: Consent. Analysis and examination of leisure in middle and later stages of the lifecycle; discussion of appropriate facilities and programming for older people. 3 hr. lec.
233. *Wildland Recreation Management.* I. 3 hr. PR: F. Man. 12 or consent. Topics include an analysis of administrative agencies concerned with wildland management; methods of ameliorating human impact on outdoor recreation resources; discussion of philosophies underlying wilderness recreation; and a review of contemporary controversies concerning wildlands. 2 hr. lec., 1 hr. lab.
234. *Wilderness in American Society.* II. 3 hr. PR: Rc. & Pk. 233 or consent. A seminar examining political, sociological, and environmental aspects of American wilderness. A discussion on articles concerning wilderness preservation, management, and aesthetics.
235. *Parks and Recreation Administration.* I. 3 hr. PR: 12 hr. recreation and parks courses, junior standing, or consent. Principles of administration as applied to the operation of recreation and park agencies, including legal foundations, policy, organization, personnel, finance, and programs of service.
238. *Tourism and Recreation Business.* 3 hr. PR: Junior standing or consent. Analysis of tourism and related recreation businesses. Resource characteristics and conflicts, marketing and development of commercial recreation enterprises. 3 hr. lec. (Offered in Fall of odd years.)

241. *Recreational Services for Special Populations.* I. 3 hr. PR: Consent. Introductory analysis of current therapeutic recreation services; attentiveness to the need for broadening recreation and park services to include members of special populations; familiarization with the planning consideration for the conduct of such services.

242. *Historical and Cultural Interpretation.* II. 3 hr. PR: Recreation and parks major or consent. Methods of locating source materials for reconstructing the historical, cultural, and physical aspects of an area for an interpretive center; preparing brochures, displays, and nature trails to facilitate interpretive activities.

248. *Environmental Concerns in Outdoor Recreation.* I. 3 hr. PR: Consent. Understanding and interpreting environmental concerns within the context of outdoor recreation.

251. *Recreation Leadership.* I. 3 hr. PR: Recreation and parks major or consent. Leadership functions and techniques, group dynamics, supervision, and use of volunteers. Theory and practice are related through a field placement with a local recreation agency.

263. *Program Planning.* II. 3 hr. PR: Recreation and parks major or consent. Fundamentals for general program planning; considers needs, facilities, age groups, local customs, climatic factors, etc. Planning involved in playgrounds, indoor centers, playfields, parks, hospitals, voluntary agencies, industries, and camps.

265. *Planning and Design of Recreation Places.* II. 3 hr. PR: Recreation and parks major or consent. Study of planning and design concepts, standards and guidelines, use continuum, grants-in-aid, and planning of selected areas of facilities: parks, pools, centers, and recreation resource areas development.

275. *Outdoor Enterprise Operations and Finance.* II. 3 hr. PR: Recreation major or junior standing. Principles and practices in planning, development, operation, and financial management of selected outdoor enterprises; considerable emphasis on assignments involving problem solving.

280. *Therapeutic Recreation Principles and Procedures.* 3 hr. PR: Rc. & Pk. 241 or consent. Basic intervention techniques in providing therapeutic recreation services, including individual and small group techniques, adaptive equipment, assistive techniques, standards, regulations, and ethics.

282. *Therapeutic Recreation Program Planning.* 3 hr. PR: Rc. & Pk. 241 or consent. Design and development of therapeutic recreation programs utilizing a systems approach based on leisure related needs of clients. Includes assessment, program development, implementation, monitoring, and evaluation.

408. *Recreation and Park Management Practicum.* 2-4 hr. PR: Consent. Field experience and conference in the study, analysis, and solution of management problems in private, commercial and governmental recreation and park organizations.

415. *Leisure and Recreation.* I. 3 hr. PR: Consent. Study of leisure as a social phenomenon and its implications for recreation.

421. *Recreation Planning: Human Interest Areas.* 3 hr. Exploration of human interest areas as sources of recreation program content; the nature, factors, and extent of participation; and their structuring and administration through work program planning. (Offered in Fall of even years.)

462. *Community Recreation.* I. 3 hr. PR: Rc. & Pk. 316 or consent. Study of problems related to providing adequate recreation services for a community. Standards and quality of recreation service; methods of measuring existing services and their coordination; community organization procedures. For leaders in voluntary agencies, schools, churches, and municipal recreation organizations. (Offered in Fall of odd years.)

472. *Seminar in Recreation.* I, II. 1-3 hr. (Repeatable up to 6 hr. credit.) Overview and critical analysis of literature in recreation interpretation, environmental concerns, or leisure studies.

REHABILITATION COUNSELING

Robert P. Marinelli, *Program Coordinator*

504 Allen Hall

Degree Offered: Master of Science

Graduate Faculty: Members L. S. Cormier, W. H. Cormier, Jacobs, Majumder, Marinelli, Masson, Moriarty, Srebalus, Tunick, and Yura. Associate Members DeLo, Greever, and Messing.

The rehabilitation counseling program in the College of Human Resources and Education offers a curriculum at the master's degree level. All students enroll for a general counseling core during their first semester and then select an area of emphasis for the balance of their graduate studies.

General Requirements for Admission

All applicants must comply with the requirements of the the College of Human Resources and Education, and the Department of Counseling and Rehabilitation Counseling. The program in rehabilitation counseling requires a program application, letters of recommendation, and a program interview.

Students are encouraged to pursue as much of their programs as possible on a full-time basis.

Core Requirements for Rehabilitation Counseling

All students will be expected to take the following core courses:

Coun. 301—Counseling Techniques

Coun. 305—Theory and Practice of Human Appraisal

Coun. 306—Counseling Theories

Coun. 309—Group Counseling Theory and Techniques

Rehab. 300—Introduction to Rehabilitation Services

Rehab. 310—Medical Aspects of Disability

Rehab. 312—Psychological Aspects of Disability

Rehab. 320—Career Development and Job Placement

Rehab. 472—Counseling Practicum

Rehab. 475—Clinical Practice

Rehab. 480—Research Seminar

Please contact the program for a listing of the additional required courses in this area.

Rehabilitation Counseling (M.S.)

This professional counseling specialty provides counseling and vocational evaluation services to persons with physical disabilities or learning difficulties and those who are seeking readjustment from emotional problems. Counselors work for both public and private rehabilitation agencies, centers, workshops, and industry. The program, which offers training options in rehabilitation counseling and vocational evaluation, as well as an option combining both areas, is accredited by the Council on Rehabilitation Education.

The degree requirements include completion of the core courses, required rehabilitation counseling courses, and a 15 hour supervised clinical practice placement (internship) under faculty direction in a rehabilitation setting. The rehabilitation counseling and vocational evaluation programs require a minimum of 48 semester hours with a 3.0 grade-point average. The combined program requires 54 semester hours. In addition to completing all course work and the internship satisfactorily, a candidate must demonstrate the ability to assume the responsibility required of a professional counselor and the

personal characteristics essential to effective working relationships with others.

Students may take the professional certification examinations to obtain national certification as a rehabilitation counselor or vocational evaluator.

Counseling (Coun.)

301. *Counseling Techniques.* I, II, S. 3 hr. PR: Consent. Development and application of basic counseling skills including interviewing, clinical observation, and a general orientation to counseling settings. Evaluation will be based on strengths and deficits in intra and interpersonal skills and on demonstration of counseling skills in checkout situations. In setting laboratory experience required.
305. *Theory and Practice of Human Appraisal.* I, II, S. 3 hr. An overview of standardized evaluation methods commonly utilized in educational and rehabilitation settings. Experience is provided in selection, administration, and interpretation of selected instruments.
306. *Counseling Theories.* II, S. 3 hr. PR: Coun. 303 and consent. A study of counseling approaches commonly used in public schools, colleges, and rehabilitation agencies. Application of theory emphasized.

Rehabilitation Counseling (Rehab.)

300. *Introduction to Rehabilitation Services.* I. 3 hr. PR: Consent. Introduction to comprehensive rehabilitation, its history and development as a philosophy process, and professional area. Professional and ethical issues in rehabilitation counseling. Other services involved in various rehabilitation settings.
310. *Medical Aspects of Rehabilitation.* II. 3 hr. PR: Consent. An overview of medical aspects and implications of disability for the handicapped person in the rehabilitation process. Studies of the more common severe disabilities and their remediation also will be included.
312. *Psychological Aspects of Disability.* II, S. 1-3 hr. PR: Rehab. 310; graduate standing and consent. The impact of disability considering cultural, interpersonal, and intrapersonal factors. Methods of assisting persons to adjust to problems of disability.
314. *Special Problems in Rehabilitation.* I, II. 3 hr. PR: Graduate standing and consent. Rehabilitation theory and techniques in problems such as blindness, epilepsy, and mental retardation. Concentrated study in special institutes.
320. *Career Development and Job Placement.* II. 3 hr. PR: Consent and graduate standing in social sciences or education. Principles and methods involved in the vocational counseling and placement of disabled persons. The use of occupational and educational information. Theories of career development, occupational analysis, and job placement in rehabilitation.
321. *Vocational Evaluation Systems and Techniques.* II. 3 hr. PR: Rehab. 300. An introduction to vocational evaluation. Formal and informal vocational evaluation systems and procedures will be explored with the goal of preliminary development of individualized evaluation plans.
322. *Advanced Vocational Evaluation Techniques.* S. 3 hr. PR: Rehab. 321. Advanced vocational evaluation systems including empirically based and informal systems will be studied. Emphasis will be on administration, scoring and interpretation, particularly as it relates to handicapped populations with specific evaluation problems.

- 323. *Seminar in Vocational Evaluation Services.* S. 3 hr. PR: Rehab. 321 and consent. Supervisory and professional issues in vocational evaluation services with an emphasis on standards, methods, procedures and resources for developing and maintaining vocational evaluation services.
- 374. *Field Work in Rehabilitation.* I, II, S. 1-6 hr. PR: Consent. Supervised field work experience in rehabilitation settings to provide rehabilitation counseling students with a more adequate orientation to their profession.
- 391. *Advanced Topics.* I, II, S. 1-6 hr.
- 462. *Clinical Conference in Vocational Rehabilitation.* II. 3 hr. PR: Rehab. 300, graduate standing, and consent. Exploration and evaluation of current methods of service delivery to vocational rehabilitation clients. Analysis and integration of service systems and the needs of the disabled client.
- 472. *Counseling Practicum.* I, II, S. 1-4 hr. PR: Graduate standing, liability insurance, and consent. Supervised experience in the application of counseling techniques in the rehabilitation process. Demonstration of high professional standards, counseling skills, and personal characteristics appropriate to the counseling relationship are essential.
- 475. *Clinical Practice.* I, II, S. 1-12 hr. PR: Liability insurance, consent, following at least one academic semester in the classroom. Clinical practice (internship) in selected agencies, rehabilitation centers, clinics, or hospitals conducting an organized program of services for the physically, mentally, emotionally, or socially handicapped. Practice will be under supervision of faculty and agency personnel.
- 480. *Seminar.* I, II, S. 1-12 hr. PR: Consent. Administration of programmatic research; legal and ethical issues in research and service programs, etc.
- 481. *Special Topics.* I, II, S. 1-6 hr. PR: Consent. Contemporary issues in the behavioral sciences and rehabilitation.
- 482. *Workshop in Rehabilitation.* I, II, S. 1-12 hr. PR: Consent. Supervision in the counseling process; vocational evaluation in rehabilitation; utilization of rehabilitation research; contemporary issues in rehabilitation.
- 491. *Directed Study and Research.* I, II. 1-6 hr. PR: Consent. Readings and/or independent research in related topic.

REPRODUCTIVE PHYSIOLOGY

E. Keith Inskeep, Chairperson of the Interdisciplinary Faculty
G-044 Agricultural Sciences Building

Degrees Offered: Master of Science, Doctor of Philosophy

Graduate Faculty: Members Butcher, Dailey, Goodman, Inskeep, Lerner, Lewis, Mawhinney, and Nath. Associate Members Collins and Horvath.

The graduate program in reproductive physiology, leading to master's and doctoral degrees, is interdisciplinary, with faculty located in the Departments of Animal and Veterinary Sciences, Obstetrics and Gynecology, Pharmacology and Toxicology, Physiology, and Plant and Soil Sciences. Requirements for admission include at least a 2.75 grade-point average (4.0 system) and completion of the following prerequisites with a grade of C or better in each: calculus, genetics, organic chemistry, physics, and vertebrate embryology. It is recommended but not required that applicants complete both the aptitude and the advanced tests of the Graduate Record Examination. Foreign languages are not required for a degree in reproductive physiology. Only a limited number of students are accepted each year.

Research Areas: Function and regression of the corpus luteum, aging of the oocyte in abnormalities of development, control of postpartum reproductive performance, metabolism and steroid receptors of male sex accessory tissue, environmental factors in reproduction, control of steroidogenesis, control of estrus and ovulation, new methods of artificial insemination, behavioral aspects of reproduction, endocrine functions of polypeptides, and roles of prostaglandins in reproduction.

Research can involve farm animals and laboratory species. The program draws on courses offered in various departments and includes courses in endocrinology, advanced reproductive physiology, biochemistry, physiology, statistics, and developmental embryology.

SAFETY STUDIES

Daniel E. Della-Giustina, *Chairperson, Department of Safety Studies*
281 Coliseum

Degree Offered: Master of Science

Graduate Faculty: Members Della-Giustina, McPherson, Marcum, Shaffron, and Sorine.

Master of Science in Safety Studies

Concentration in safety studies at the master's and post-master's degree level provides opportunity for individuals to elect courses and related experiences aimed at developing competencies needed by traffic safety educators, occupational safety managers, or school safety coordinators. Baccalaureate degree programs from which students are usually admitted include business management, engineering, technology education, physical education, physical science, psychology, sociology and anthropology, or safety, provided that a 2.75 grade-point average has been achieved. Otherwise, admission must be of provisional status, which requires the student to earn a 3.0 average during the first 12 semester hours.

University regulations for graduate study govern the general requirements of the master of science degree. Additionally, however, the candidate must complete a minimum of 36 semester credit hours, including approved research in safety to qualify as a degree recipient. A grade-point average of 3.0 is required for graduation.

Course work is planned in consultation with the adviser and approval must be obtained from the adviser before enrollment in courses. Six semester hours of course work may be devoted to directed electives from one of the student's undergraduate major or minor fields or from a field allied to safety. Students are encouraged to complete the aptitude test of the Graduate Record Examination within the first 18 semester hours after matriculation.

A student is accepted as an advanced candidate for the degree if course work and requirements are satisfactory, as judged by the graduate committee of the department. During the final session or semester of study, each student is required to pass an examination dealing with the core subject matter and specialization emphasis.

Off-Campus Graduate Program

Courses are scheduled at the four WVU off-campus graduate centers.

Certificate of Advanced Study (C.A.S.)

This area of specialization is aimed at preparing individuals with emphasis in safety management training beyond the master's degree. The completion of a master's degree in safety or the equivalent is comparable to the WVU master of science in safety studies with approved practicum experience. In order to graduate, the student must complete 36 semester hours of approved graduate work. A minimum grade-point average of 3.2 on all course work attempted is required. The student must defend a research problem in areas of specialization for the certificate of advanced study.

Safety Studies (Saf. S.)

- 231. *Safety in Motor Transportation Services.* 3 hr. PR: Saf. S. 131 or consent. (May not be taken for both undergraduate and graduate credit.) Safety elements of automotive transportation including design, operation, planning, control, and effects of legislation.
- 232. *Safety Education Principles and Content. I.* 3 hr. PR: Saf. S. 131 or consent. Study and analysis of content areas usually recommended for instructional programs within the field of safety, with emphasis on structured learning experiences.
- 234/334. *Establishing and Managing Fire Services.* 3 hr. Analysis of fire services usually provided under safety manager jurisdiction, with special attention to legal bases, organizational structure, services rendered, training needs and management techniques.
- 239/339. *Security Management Practices and Problems.* 3 hr. Safety manager responsibilities for security of persons and property including organizational patterns, personnel competencies expected, surveillance and monitoring Methods, and occupational problems among security personnel.
- 255/355. *Traffic Safety Management.* 3 hr. PR: Saf. S. 151 or equiv. Elements of traffic safety management in public and private sectors are examined. Role of management organization, approaches, and programs is examined in light of the need for a safe and efficient highway transportation system. 3 hr. lec.
- 256. *Driver and Safety Instructional Innovations.* 3 hr. PR or Conc.: Saf. S. 151. Innovations used in classroom and laboratory instruction applied to driver and safety education are studied (e.g., multimedia, multi-vehicle, in-vehicle, on-street, simulation). Specific aspects of instruction are based on current literature and research.
- 257/357. *Alcohol Safety Programs.* 3 hr. Safety programming in schools, community, and the workplace. Approaches, programs, and materials are examined for use at the local level. Scientific reports are studied to determine the effectiveness of various approaches. 3 hr. lec.
- 291. *Special Topics. I, II, S.* 2-6 hr. PR: Consent. Consideration of persistent issues and changing problems in the safety field. Seminar emphasis extends considerable attention to safety interests of participating class members.
- 301. *Safety Function Management Integration. I, II, S.* 3 hr. PR: Consent. Consideration of integrated arrangements, common constraints, developmental level, essential guidelines, staff liaison, project improvement, effectiveness audits, and collaboration needed to assure success of the safety function.

303. **Risk Counteractant Resource Preparedness.** I, II, S. 3 hr. PR: Consent. Counteraction of risk involving deficient resource preparedness by emphasizing problems delineation, ergonomic adjustments, work-task analyses, performance standards, quality supervision, essential training and pertinent management techniques.

310. **Controlling Environmental and Personnel Hazards.** I or II, S. 3 hr. PR: Saf. S. 300 or consent. Investigation of hazard control principles relating to environmental facilities and equipment including control procedures recommended by authorities from the fields of engineering, medicine, and public health as well as from the field of safety.

331. **Safety in Motor Transportation Services.** 3 hr. PR: Saf. S. 131 or consent. (May not be taken for both undergraduate and graduate credit.) Safety elements of automotive transportation including design, operation, planning, control, and effects of legislation. 3 hr. lec.

332. **Safety Education Principles and Content.** 3 hr. PR: Saf. S. 131 or consent. Study and analysis of content areas usually recommended for instructional programs within the field of safety with emphasis on structured learning experiences. (3 hr. lec.)

333. **Disaster Preparedness and Emergency Systems.** I or II, S. 3 hr. PR: Saf. S. 300 or consent. Major elements involved in disasters and emergencies, preparedness planning, systems utilization, and attention to essential human services, with emphasis on community action.

334. **Establishing and Managing Fire Services.** I or II, S. 3 hr. PR: Saf. S. 300 or consent. Analysis of fire services usually provided under safety manager jurisdiction, with special attention to legal bases, organizational structure, services rendered, training needs, and management techniques.

335. **Safety Legislation and Compliance Operations.** I, S. 3 hr. PR: Saf. S. 300 or consent. Comprehensive study and analysis of federal and state legislation which mandates compliance with certain safety conditions and practices related to work performed in occupational and comparable settings.

339. **Security Management Practices and Problems.** I or II, S. 3 hr. PR: Saf. S. 300 or consent. Safety manager responsibilities for security of persons and property including organizational patterns, personnel competencies expected, surveillance and monitoring methods, and occupational problems among security personnel.

356. **Driver and Safety Instructional Innovations.** 3 hr. PR or Conc.: Saf. S. 151. (May not be taken for both undergraduate and graduate credit.) Innovations used in classroom and laboratory instruction applied to driver and safety education are studied (e.g., multimedia, multivehicle, in-vehicle, on-street, simulation). Specific aspects of instruction are based on current literature and research. 2 hr. lec., 1 hr. lab.

357. **Alcohol Safety Programs.** 3 hr. Safety programming in schools, community, and the workplace. Approaches, programs, and materials are examined for use at the local level. Scientific reports are studied to determine the effectiveness of various approaches. 3 hr. lec.

361. **Loss Initiating Adversities Remediation.** I, II, S. 3 hr. Perception of adversities tolerated as an extension of uncontrolled hazardous exposure with remediation concentrated upon identification, confirmation, and correction services including utilization of specialist personnel.

363. *Disabled Enterprise Resources Restoration.* I, II, S. 3 hr. PR: Consent. Examination of management guidelines, reporting procedures, insurance variations, rehabilitation and restoration efforts, and recovery procedures needed to successfully restrain losses attributed to disabled enterprise resources.

418. *Safety, Measurement, Evaluation, and Research.* II, S. 3 hr. PR: Saf. S. 300. Analysis of evaluative data and statistical procedures applicable to the safety field plus investigation of the nature and purposes of research dealing with safety and accident prevention with emphasis on human and environmental factors.

452. *Manpower Development for Safety Responsibilities.* II. 3 hr. PR: Graduate standing in safety studies and consent. Safety manpower positions, needs and problems in relation to efforts by business, industrial, governmental and educational agencies to provide sufficiently effective professional and sub-professional preparation of safety practitioners.

459. *Directed Study.* I, II, S. 1-6 hr. PR: Doctoral level standing and consent. (Required of all candidates for doctoral degrees in safety studies.) Analysis of research designs and procedures for compilation, organization, treatment, and interpretation of data for safety research projects.

468. *Essential Safety Management Information.* I, II, S. 3 hr. PR: Consent. Examination of information needed for safety management success, harm investigation procedures, evaluation techniques, nonrealized profit calculations, and decision-making which should enhance improvement of all safety function affairs.

472. *Practicum.* I, II, S. 1-6 hr. PR: Graduate standing in safety studies and consent. Individual and/or group experiences in development, implementation, and participation in special projects involving safety education, safety services, and environmental safety in schools, colleges, or communities.

490. *Teaching Practicum.* I, II. 3-15 hr.

491. *Advanced Study.* I, II, S. 1-16 hr.

497. *Research.* I, II, S. 1-15 hr.

SECONDARY EDUCATION

W. Michael Reed, *Interim Chairperson of Graduate Programs*
602 Allen Hall

Degree Offered: Master of Arts

Graduate Faculty: Members Bower, Deay, Gerlach, Haas, Hoffman, Holtan, Iannone, Obenauf, Phillips, Reed, Saltz, P. Smith, and Thomas. Associate Members Carline and Hobbs.

The Division of Education offers graduate programs and opportunities for research leading to the degree of master of arts, and options for the certificate of advanced study and doctor of education for professional educators and other professionals for whom advanced study in curriculum and instruction and educational responsibilities is important. Areas of emphasis include secondary education, higher education, and librarian-media education. The major emphases in all programs are curriculum and instruction. Optional tracks in specific subject and program areas are available. Programs are planned jointly by the student, the student's adviser, and the student's committee to meet the career needs of the student. In addition to the general requirements of the University and the College of Human Resources and Education, a core of courses or course areas and supporting competencies is required of all graduate students in the department.

The College of Human Resources and Education offers a master of arts program in secondary education for persons who teach or work in teaching-

related situations with adolescents and adults. The purpose of the program is to provide academic experiences to increase skills in teaching and curriculum development and knowledge of a teaching specialization. The program provides the opportunity to specialize in working with students in junior, middle, and high schools and with adults in post-secondary settings. Electives are used to provide a solid basis in the subject area that the student teaches. With adviser approval, electives may also be used to enhance students' personal goals. While teacher certification is not a part of the master's program, students may be able to complete some courses required for certification while working on a graduate degree.

For further information on admission and program requirements, write Chairperson, Curriculum and Instruction, WVU College of Human Resources and Education, 602 Allen Hall, P.O. Box 6122, Morgantown, WV 26506-6122. All applicants must comply with the requirements of the College of Human Resources and Education and the Division of Education.

Master of Arts Program Tracks

Secondary Education*

		Hours			
		Program	A ¹	B ²	C ³
I. Graduate Courses in Education					
C&I 304			3	3	3
Ed. F. 320 or 340			3	3	3
Approved course in Curriculum/Instruction in student's content fields			3	3	3
Approved course in General Teaching Strategies or General Curriculum Developments			3	3	3
Ed. P. 320			3	3	0
C&I 391			0	3	0
C&I 497			6	0	0
Approved Education Electives			0	3	6-12
II. Approved Graduate Courses Outside of Education			9	9	12-18
			30	30	36

¹Thesis required.

²Problem required.

³36 semester hour course work program.

⁴Adviser will provide lists of courses which may be selected.

⁵Usually courses in the student's content speciality.

*Students who plan to teach at the college level, who wish to study the impact of technology on people, society, and the environment, or who wish to prepare for a career as librarian-media specialist, may pursue a concentration of course work emphasizing those areas.

Higher Education Curriculum and Teaching

		Hours
I. Graduate Courses in Education		18-24
Required Courses in Education		15
Ed. F. 320 or Ed. F. 340		3
C&I 307		3
C&I 387		3
C&I 489		3
Ed. P. 300		3
II. Approved Education Electives		3-9
		18-24
III. Graduate Courses in an Academic Area		12-18
Total		36

Librarian-Media Specialist

A combination of undergraduate courses and courses in the graduate program is necessary to meet certification requirements.

Master of Arts in Education

		Hours	
	Program	A ¹	B ²
I. Required Courses in Education			
C&I 301		3	3
C&I 304		3	3
C&I 387		3	3
Ed. Found. 320 or Ed. Found. 340		3	3
		12	12
II. Courses in Library Science		24	12 ³
		36	36

¹For those desiring certification as school media specialist K-12. Specific courses in library science are required. For further information, see section on library science.

²For those who already have certification.

³Graduate courses other than those required for certification.

Curriculum and Instruction (C&I)

205. *The Junior High School.* I, II, S. 2 hr. PR: Consent. Developing philosophy, program, and practices of the junior high school.
224. *Approaches to Teaching Language.* II. 2 hr. PR: Ling. 1 and Engl. 111. Designed for prospective teachers of English and language arts. Focus is upon planning and implementing methods of teaching English as a language. Materials and resources appropriate to public school instruction are analyzed and utilized.
225. *Approaches to Teaching Literature.* II. 2 hr. PR: Junior standing. Designed for prospective teachers of English and language arts. Course focuses upon methodologies for teaching literature in public schools. Workshop format will provide opportunities for peer teaching activities as students apply methods of teaching literature.
280. *Special Problems and Workshops.* I, II, S. 1-4 hr. (Maximum of 8 semester hours may be applied toward the master's degree.) PR: 14 hr. in education. Credits for special workshops and short intensive unit courses on methods, supervision, and other special topics.
287. *Advanced Clinical Experience.* I, II, S. 1-6 hr. PR: Consent. Clinical experience in teaching-learning situations at any level.
300. *U.S. Education for International Students.* I. 3 hr. PR: International students with graduate status and developing oral and written English skills. To assist international students in understanding the U.S. system of education. Included: dominant U.S. values related to education; structure of U.S. education at all levels; models and strategies; field trips; international comparisons.
304. *The Secondary-School Curriculum.* I, II, S. 3 hr. PR: High-school teaching experience or consent. Emphasizes socioeconomic and cultural influences on the curriculum; principles of curriculum development; curriculum building in the various teaching fields; techniques of experimentation and evaluation; and practice in curriculum building with special emphasis on unit construction.
306. *Curriculum for Middle Childhood.* I, S. 3 hr. Survey course which includes: historical, social, and cultural influences on the curriculum; the learner characteristics; curriculum and instructional organization and their relationship to facilities available; evaluation and implementation of middle childhood curriculum.

307. *Curriculum Development*. I, II, S. 3 hr. PR: C&I 301 or 304 or 312 and Ed. F. 320 or consent. Basic foundation in the concepts underlying the school curriculum in American society.

308. *Introduction to Alternative Learning Environments*. I. (Alternate Years.) 3 hr. This course will provide opportunities for educators to explore and analyze the trends and issues in alternative learning environments in public education.

309. *Experiences in Alternative Learning Environments*. S. (Alternate Years.) 6 hr. PR: C&I 308, Ed. F. 320, consent. This course helps teachers to learn and practice the skills that are needed to be an effective teacher in an alternative teaching environment.

323. *Contemporary Issues in English Education*. I. 3 hr. PR: Graduate standing. Provides the student with a knowledge of several contemporary issues in English teaching which have immediate and long-range ramifications for secondary-school English instruction. 1-hr. lec., 2-hr. seminar.

324. *Advanced Methods in English Education*. II. 3 hr. PR: Graduate standing. (For classroom teachers of English.) Will involve an analysis of recent trends and innovations in methodology. Readings and discussions will lead to the development of instructional strategies and units for secondary English classrooms. 1-hr. lec., 1-hr. lab., 1-hr. seminar.

333. *Corrective Techniques in Mathematics Education*. I, S. 3 hr. PR: Consent. Materials and methods used in diagnosis and remediation of learning difficulties in mathematics.

334. *Mathematics in the Secondary School*. I, S. 3 hr. PR: Consent. Patterns of mathematics curriculum in the secondary school; practices in teaching mathematics; preparation, selection and use of instructional materials.

337. *Mathematics in the Junior High School and Middle School*. II. 3 hr. PR: 6 hr. college mathematics or consent. Study of teaching of mathematics in the junior high school and/or middle school; application of mathematics content to teaching; instructional techniques and materials.

354. *Social Studies in the Secondary School*. S. 3 hr. PR: Consent. Nature and function of social studies in the secondary school; utilization of community, state, national, and world resources in teaching; selection of content for teaching purposes; curriculum construction with emphasis on resource and teaching units.

357. *Principles of Economic Education*. S. 3 hr. Workshop for principals, teachers, and supervisors with emphasis on the economic structure of our society and methods of integrating economics into the school program. (Sponsored jointly by College of Human Resources and Education and College of Business and Economics.)

359. *Classroom Simulation Techniques*. II, S. (Alternate Years.) 3 hr. To provide experience in the use of learning games and simulations as an instructional technique and the opportunity to develop—under supervision—simulated activities and games to be used in a variety of learning environments.

373. *Professional Development*. I, II, S. 1-6 hr. (May be repeated.) PR: Department approval. Specially designed experiences for those interested in advancing professional skills in a particular specialty. Not for degree credit in programs in the College of Human Resources and Education. (Graded as S or U.)

377. *Children's Television: Problems and Potentials*. S. 4 hr. PR: Consent. Provides parents and teachers with strategies for monitoring, evaluating, and directing television viewing habits of youth; pertinent research studies, school and community action programs, and home and school education programs are discussed and practiced.

380. *Special Topics*. I, II, S. 1-6 hr. PR: Consent.

383. *Seminar. I, II, S. 1-6 r.* PR: Consent.

385. *Supervision of Student Teachers. I, II, S. 3 hr.* PR: Consent. For persons working or intending to work with education students in field experiences. Course focuses on the development and application of supervisory skills involved in effective guidance of student teachers and education students.

386. *Teaching Strategies for Middle Childhood. II, S. 3 hr.* Surveys instructional strategies appropriate for facilitating preadolescent learning. Including the role of the teacher, how the teacher uses resources within and outside the classroom as they relate to instruction of the learner ages 10-14 years.

387. *Advanced Teaching Strategies. I, II, S. 3 hr.* PR: Graduate standing. Deals with methods as one critical variable in teaching. Examines the ways and means to describe, plan the use of, implement and evaluate teaching methods. Analysis and implementation of teaching methods and component skills of teaching.

388. *Classroom Organization and Management. I, S. 3 hr.* Discusses research identifying components of classroom organization and environment which influence learning; reviews teacher behaviors and learning activities which research indicates lead to more effective teaching. Stresses implementation strategies relevant to classroom settings.

389. *Education That Is Multicultural. I, S. 3 hr.* PR: Graduate standing or consent. Provides opportunities for educators to increase awareness of their own ethnic backgrounds, foster understanding of racial/ethnic diversity, and develop appropriate teaching materials and methods for elementary and secondary curricula.

391. *Advanced Topics. I, II, S. 1-6 hr.*

395. *Practicum. I, II, S. 1-12 hr. per sem. or session*—aggregating not more than 12 hr. PR: 9 graduate hours in education. Enrollment with permission of adviser or instructor in consultation. Special individual and group projects. To provide appropriate residence credits for special workshops, prolonged systematic conferences or problems and projects in education.

407. *Instructional Models of Teaching. II. 3 hr.* PR: Ed. F. 320 or consent. Concepts and processes involved in teaching and their relationship to the development of teacher education programs.

408. *Contemporary Determinants of Curriculum. II, S. 3 hr.* PR: C&I 307 and Ed. F. 340 or consent. Contemporary determinants of curriculum development.

409. *Curriculum Theories. I, II, S. 3 hr.* PR: C&I 408 or consent. Theories underlying curriculum from the past to the present and projected to the future.

410. *Advanced Supervision. 3 hr.* PR: Consent. Exploring theories, research, and practice of preservice and inservice instructional supervision in the classrooms of novice and mature teachers. (Also listed as Ed.A. 410.)

438. *Survey of Major Issues in Mathematics Education. II, S. 3 hr.* PR: Consent. Individual and group research on selected topics in mathematics education.

457. *Social Studies Curriculum Development, K-12. I. 3 hr.* PR: C&I 301 or 304 and C&I 350 or 354. Stresses the application of principles and procedures pertinent to the development of social studies programs in elementary and secondary schools. Strong emphasis will be placed on the analysis of current social studies curriculum materials.

460. *Planning Programs and Courses for Vocational Agriculture Department. I, S. 2 hr.* PR: C&I 188. Gathering data, studying the farming problems of all-day students, young farmers, and adult farmers, and planning the total program for the department.

488. *Higher Education Curriculum.* II. 3 hr. An analysis of evaluation of post-secondary curriculum with emphasis on organizing, translating, and applying findings. Topics include curriculum-shaping forces; institutional patterns; policy, components and change; and principles and techniques of development, experimentation, and evaluation.

489. *Teaching in Higher Education.* I. 3 hr. PR: Graduate standing. A general methods course involving instructional concepts and strategies for present/prospective faculty in higher education. Comprehensive consideration of objectives, planning criteria and methods, teaching strategies, and evaluation in meeting the needs of adult learners.

490. *Teaching Practicum.* I, II, S. 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility. Provides a supervised experience in a teaching situation. (Graded as S or U.)

491. *Advanced Study Project in Education.* I, II, S. 3-6 hr. Research for the program leading to the Certificate of Advanced Study in Education.

496. *Advanced Seminar.* I, II. 1 hr. PR: Consent. Opportunity for the advanced graduate student to present the student's research to faculty and/or student groups.

497. *Research.* I, II, S. 1-15 hr.

499. *Colloquium in Curriculum and Instruction.* I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit, but who wish to participate in academic programs.

SOCIAL WORK

Michael A. Patchner, Dean of School of Social Work

708 Allen Hall

Degree Offered: Master of Social Work

The School of Social Work had its beginnings as a department in the early 1930s. In 1971, Social Work became an independent school; its programs are accredited by the Council on Social Work Education. Graduates of the M.S.W. program are eligible to sit for licensure examinations as social workers in West Virginia and most other states. The graduate program is part of the comprehensive program of professional education in social work offered by the School of Social Work, including degree programs at baccalaureate and master's levels and a range of continuing education opportunities on the campus and in other areas of West Virginia.

The early decades of the graduate program paralleled the period when the scope of the mental health movement was being enlarged and emphasis was placed upon individual and group intervention and treatment. The 1960s were characterized by more political and social change throughout the school's programs. At present the graduate program still includes some of these aspects but to lesser degree, with three concentrations including aging and long term care, community health/mental health, and family.

Social work is primarily concerned with enhancing the problem-solving, coping, and developmental capacities of people, promoting effective and humane operation of resources and service delivery systems, linking people with appropriate resource and service opportunities, and improving social policy.

The graduate program concentrates upon offering advanced specialized training for social work practice, with an emphasis on rural areas and small towns. The School of Social Work is nationally recognized in the area of rural

social work practice, and the faculty members regularly contribute to this field through presentations, papers, conferences, and other means.

A program of advanced standing for qualified students is offered in addition to the regular M.S.W. program. In addition to full-time matriculation, a part-time plan of study is available.

Field instruction opportunities are available throughout northern and central Appalachia, as well as in a select number of settings outside the region. Classes focus upon a blend of local, region, and national perspectives. The graduate program in social work offers enhanced educational opportunities in a number of specialized problem areas: aging and long-term care, family, health and mental health.

Graduates are employed throughout the United States and Canada. They work as individual, family, and group treatment specialists, planners, community organizers, social researchers, social work educators and administrators in a variety of programs, such as mental health clinics, hospitals, correctional institutions, courts, delinquency programs, aging programs, family counseling agencies, child protective agencies, public welfare departments, child development programs, manpower agencies, public schools, community action agencies, settlement houses, city governments, state government planning agencies, federal administrative agencies, and private research and development organizations concerned with human problems.

There has been a constant growth in the need for professional social workers. It is anticipated by the Bureau of Labor Statistics and other research bodies that the demand for social workers will continue to increase in numbers and in varieties of programs in which social workers are employed. The WVU social work curriculum is designed to help students prepare for these careers. Students are required to work closely with their academic advisers in selecting appropriate components in class and field learning to meet their individual needs.

Curriculum

Increasingly aware of the maturation of baccalaureate social work education (in which the School of Social Work has been a national leader), the graduate program provides the opportunity to simultaneously broaden and deepen the knowledge and skill levels of those with baccalaureate education in social work through a program of advanced standing.

For those who do not have a baccalaureate degree in social work or who do not qualify for the advanced standing program, the regular M.S.W. degree is offered. Through both the regular M.S.W. program and the program of advanced standing, students are exposed to the areas of social work practice, social welfare policy, theories of human behavior and social environments, social work research, and field instruction.

In addition, incoming students designate a specialized problem area or concentration on which they will focus. Available concentrations are: aging and long term-care, community health and mental health, and family.

1. Aging and Long-Term Care Concentration—The aging concentration is designed to provide an educational program in gerontological social work. The program presents knowledge, values, ethics and skills that enable the student to understand and critically assess the aging process; the needs, problems and resources of the aged; and the social policies, institutions, programs and services intended to address the aged. The concentration courses emphasize long term care and rural practice. Both class and field instruction emphasize the role of the M.S.W.-level practitioner as the

administrator, supervisor, manager or planner and provider of services for the aged.

2. Community Health and Mental Health Concentration—The community health and mental health concentration provides students with a generic model of practice as adapted to the evolving field of health and mental health. Particular emphasis is placed on community approaches to primary prevention and on the use of community support systems for the deinstitutionalized patient. Field placements emphasize the health and mental health field as a network of interrelated agencies and functions with attention to the tasks of planning, administration, community organization, direct practice, and research.

3. Family Concentration—The family concentration provides education towards the development of the knowledge, skills, and values that enable the student to perform competently in human service systems whose programs and policies directly affect family well-being. Students learn the tasks of the social worker in social service agencies, other community systems, and advocacy roles inside and outside the agency and community system. These social work roles encompass preventing and treating neglect, abuse and exploitation, developing and supervising alternative family care systems, deinstitutionalization, policy and program development, and adolescent emancipation programs. Particular emphasis is placed on direct practice roles in delivering family services.

Joint Degree Option

A joint degree option resulting in the Master of Social Work (M.S.W.) and Master of Public Administration (M.P.A.) is available through the School of Social Work and Department of Public Administration of the College of Arts and Sciences. For a student admitted to the regular M.S.W. program, a total of 82 credit-hours are required to meet the joint degree requirements. For a student admitted to the advanced standing M.S.W. program, a total of 67 credit hours are required to meet joint degree requirements. Many students complete such requirements through one additional semester of study beyond the semesters required for the M.S.W. degree.

Applicants for the joint degree program apply to each program separately, specifying on each application that they are a joint degree applicant. Applicants must meet the admission requirements of each program and acceptance by one program does not guarantee acceptance by the other.

Additional information and descriptive materials about the joint degree program are available from either the Assistant to the Dean, School of Social Work, 708 Allen Hall, West Virginia University, Morgantown, WV 26506, or the Department of Public Administration, 302 Woodburn Hall, West Virginia University, Morgantown, WV 26506.

Admissions

General Admission Requirements

Students admitted to the graduate program may be admitted to the regular M.S.W. program (56 credit hours) or to the advanced standing M.S.W. program (41 credit hours).

Students requesting admission must demonstrate the following:

1. Proof of academic achievement. Graduate regulations require an undergraduate grade-point average of at least 2.5 for approval of candidates as a regular graduate student. An accepted applicant whose grade-point average is less than 2.5 is classified as Provisional. See the graduate catalog, "Classification of Graduate Students" for a description of admission categories.
2. Evidence of potential to practice social work, such as commitment to human service, and a concern and ability to work effectively with people.
3. Evidence of having successfully completed at least 30 hours of upper-level courses in the liberal arts.

For full-time applicants, preference will be given in admissions to students who have a total of at least one year of paid and/or volunteer human service work experience. Applicants for the part-time program must have the equivalent of two years' work experience in human services.

Admission to Regular M.S.W. Program

Applicants falling within the following categories are eligible for admission to the regular M.S.W. program (56 credit hours):

1. Students with a baccalaureate degree in social work or social welfare whose cumulative grade-point average in their social work courses is below 3.0 (on a 4.0 scale).
2. Students with a baccalaureate degree in social work or social welfare whose cumulative grade-point average in all courses is less than 2.5. Such students are admitted as Provisional Students in the regular M.S.W. program.
3. Students with a baccalaureate degree in a field other than social work or social welfare.

Students admitted to the regular M.S.W. program complete a minimum of 56 credit hours. They are required to complete three professional orientation courses: *Introduction to Social Work Practice* (So. Wk. 340), *Social Welfare Policy and Services* (So. Wk. 331), and *Introduction to Growth and Behavior* (So. Wk. 310). They also complete 20 credit hours of field instruction. If enrolled as full-time students, they will ordinarily complete two semesters and one six-week summer session of course work and one six-week summer session and one semester of concentration-focused field instruction.

Admission to Advanced Standing M.S.W. Program

Applicants meeting the following criteria are eligible for admission to the advanced standing M.S.W. program (41 credit hours):

Students with a baccalaureate degree in social work or social welfare from a Council on Social Work Education accredited program whose cumulative grade-point average in all courses is 2.5 (on a 4.0 scale) and whose cumulative grade-point average in their social work courses is 3.0 or higher.

If enrolled as full-time students, advanced standing students ordinarily complete one semester and two six-week summer sessions of course work and one semester of concentration-focused field instruction.

Part-Time Students

In the fall semester, applicants may be admitted as part-time students to either the regular M.S.W. program or advanced standing M.S.W. program. Part-time students must follow a degree plan that provides for the appropriate sequencing of courses. Students are required to complete at least six credit hours each semester while enrolled as part-time students. The entire degree may be completed on a part-time basis; however, the plan of study must be completed within a four-year time span.

More information about part-time study can be found in the discussion of admission dates, plan of study, and program requirements.

Application Deadline

Applications for fall semester must be completed by May 1. Applicants whose admission files are completed after the deadline date will only be considered if space is available.

Admission Dates

Full- and part-time students are admitted to the regular or advanced standing M.S.W. programs during the fall semester only.

Master of Social Work (M.S.W.)

The degree of Master of Social Work (M.S.W.) is conferred upon those students who satisfactorily complete the requirements as established for graduate education. These requirements are:

1. Satisfactory completion of no less than 56 semester hours for those admitted to the regular M.S.W. program and 41 semester hours for those admitted to the advanced standing M.S.W. program. These hours may be earned through the Morgantown program on the main campus. Exceptions in this category would pertain to candidates whose earned credit entitled them to be exempt from certain courses.

2. Students may request credit for up to 12 hours earned in graduate study in approved courses. Requests for such transfer credit must be made at the time of application to the program.

3. Satisfactory completion of all components of the graduate program. Those components include course work in social work practice, social welfare policy, human behavior and social environments, social work research, a concentration area, and field instruction. All M.S.W. candidates must complete the requirements summarized below for the degree program to which they were accepted (i.e., regular or advanced standing).

Plan of Study

Full-time students typically complete 15 credit hours per semester when they are enrolled in classroom courses. Fourteen hours of credit are typically awarded for one semester of field instruction; six hours of credit are typically awarded for one summer session of field instruction, should the student's degree plan require one summer session of field. Full-time students are required to complete 12 credit hours in the summer sessions.

Part-time students are required to enroll for six credit hours each semester. Accrediting requirements require that students be enrolled for at least six hours each registration period and that all work toward the degree be completed within a four year period. Part-time students must work closely with their advisers to assure that their degree plan is consistent with accreditation requirements.

Students admitted to the MSW degree program may not receive credit toward the degree for courses numbered 200 to 299. Students wishing to transfer credit from another program are also subject to this restriction. A copy of the typical plan of study for degree candidates is available on request from the School of Social Work.

Field Instruction

Field instruction is an integral part of graduate social work education. It provides the student with an opportunity to test classroom knowledge as well as to develop and refine advanced practice skills.

Field placement settings are located in West Virginia, Pennsylvania, Ohio, Maryland, Virginia, and Washington, D.C. Decisions regarding the field placement assignment are jointly reached by the student, faculty adviser, and concentration committee. Only sites on the School of Social Work's approved list may be used for field instruction. The field placement setting that can best meet the student's educational needs may be located outside the Morgantown area. Therefore, students may find their educational interests best served by leaving the home campus for field placement.

Regular M.S.W. students must have completed, at a minimum, S.W. 313, S.W. 310, S.W. 311, S.W. 331, S.W. 340, S.W. 441, the first concentration course, and any practice elective specified by their concentration before being eligible to enter field placement. All courses must be completed with a grade of C or better and students must have an overall minimum grade-point average of 2.75. Students are also required to attend a pre-placement integrative seminar. Additional requirements may be imposed by the student's degree plan.

Advanced standing students must have completed, at a minimum, S.W. 313, S.W. 311, S.W. 441, the first concentration course, and any practice elective specified by their concentration before being eligible to enter field placement. All courses must be completed with a grade of C or better and students must have an overall minimum grade-point average of 2.75. Students are also required to attend a pre-placement integrative seminar. Additional requirements may be imposed by the student's degree plan.

Full-time regular M.S.W. students typically enter field placement during the second summer session (in July) and complete their placement and the degree program during their fourth semester (August-December) in the program. Their field placement is typically preceded by two semesters and one summer-session of classroom work.

Full-time advanced standing M.S.W. students typically enter field placement during their second semester (January-May) in the program. Their field placement is typically preceded by one semester of classroom work and followed by summer sessions of classroom work.

Part-time students typically enter field placement after having completed 24 credit hours of classroom work for those in the regular M.S.W. program or 18 credit hours of classroom work for those in the advanced standing M.S.W. program. Their field placement is typically followed by one semester of full-time classroom study.

Field placement is typically completed on a full-time "block" plan. Part-time field instruction requires the completion of a minimum of three full days per week in field placement. Part-time field instruction may be combined with concurrent classroom instruction.

Regular M.S.W. students must complete a minimum of 900 clock hours in field instruction. Advanced standing M.S.W. students must complete a minimum of 560 clock hours in field instruction. Students are required to attend integrative seminars scheduled concurrently with field placement and to complete a paper dealing with the integration of field and classroom study.

Summary of Degree Requirements for Advanced Standing M.S.W. Program*

	<i>Hours</i>
Advanced Practice Courses	
Practice with Individuals, Families, and Small Groups (So. Wk. 441)	3
Other Practice Courses (Selected in consultation with adviser)	6
Human Behavior and the Social Environment	
Human Behavior and the Social Environment II (So. Wk. 311)**	3
Advanced Social Welfare Policy Analysis (So. Wk. 333)	3
Research Courses	
Social Research Methods (So. Wk. 313)	3
Research Elective	3
Concentration Courses	6
(Selected in consultation with adviser)	
Field Instruction	<u>14</u>
Total	<u>41</u>

Summary of Degree Requirements for Regular M.S.W. Program*

	<i>Hours</i>
Professional Orientation Courses	
Introduction to Social Work Practice (So. Wk. 340)	3
Social Welfare Policy and Services (So. Wk. 331)	3
Human Behavior and the Social Environment I (So. Wk. 310)**	3
Human Behavior and the Social Environment	
Human Behavior and the Social Environment II (So. Wk. 311)***	3
Advanced Practice Courses	
Practice with Individuals, Families, and Small Groups (So. Wk. 441)	3
Other Practice Courses (Selected in consultation with adviser)	6
Advanced Social Welfare Policy Analysis (So. Wk. 333)	3
Research Courses	
Social Research Methods (So. Wk. 313)	3
Research Elective	3
Concentration Courses (Selected in consultation with adviser)	6
Field Instruction	<u>20</u>
Total	<u>56</u>

*Students may elect to take additional courses beyond these requirements.

Social Work (So. Wk.)

310. *Introduction to Growth and Behavior.* 3 hr. Study of behavior as basically learned responses acquired from social situations and experiences. Individual and group behavioral norms from varying and diverse sociocultural environments are examined.
311. *Introduction to Growth and Behavior II.* 3 hr. PR: So. Wk. 310 or equiv. Further study of psycho-social and cultural determinants designed to increase knowledge and understanding of individual and group behavior through an analysis of social organizations with a special focus on the impact of deprivation.
313. *Social Work Research Methods. I, II.* 3 hr. (Research Course.) Basic concepts in social research methods. Emphasis on conceptualization of social work problems for research, role of social science theories in research, measurement options in research design, and analysis of data.
322. *Human Behavior and the Social Environment* 2. 2 hr. In this course the objective is to increase understanding of organizations, communities, and small groups as they develop, change, and affect behavior of those affiliated with them.

323. *Social Support Systems.* I, II. 3 hr. (*Human Behavior and Social Environment Course.*) Social science theories pertinent to social support system concepts. Formally organized systems and natural helping networks are considered. Program models related to particular target populations, such as mentally ill, the aged, etc., are examined.

324. *Human Service Organizations.* II. 3 hr. (*Human Behavior and Social Environment Course.*) Forces that characterize the establishment, maintenance, and transformation of human service agencies.

325. *Social Welfare in American Communities.* I. 3 hr. (*Human Behavior and Social Environment Course.*) Current theory and research on social welfare institutions in American communities. The course provides a conceptual framework for community practice, with particular attention to social movements, inter-organizational relationships and strategies for social change.

331. *Social Welfare Policy and Services.* I. 3 hr. (*Policy Course.*) Introduction to the history, development, and implementation of social policy in the United States. Special emphasis is given to those policies which have the greatest impact on non-metropolitan areas and the Appalachian region.

333. *Social Policy Analysis.* II, S. 3 hr. (*Policy Course.*) PR: So. Wk. 331. Skill development in techniques of social policy analysis. Selection of analytical methods and issues offered in different sections.

340. *Introduction to Social Work Practice.* I. 3 hr. (*Practice Course.*) Focuses on developing the basic framework of social work practice theory and professional values to working with individuals, groups, families, and communities.

341. *Social Treatment Groups.* II. 3 hr. (*Practice Course.*) PR: So. Wk. 340. The use of social relationships in small groups in treating personal problems.

342. *Task Group Processes.* I. 3 hr. (*Practice Course.*) PR: So. Wk. 340. The use of social relationships in small groups for problem-solving tasks.

345. *Supervision in Social Work.* II, S. 3 hr. (*Practice Course.*) PR: So. Wk. 340. Functions, conflicts, and dynamics of supervision of professionals, and the relationship of ethical and value principles.

346. *Experiential Groups.* S. 3 hr. (*Practice Course.*) PR: So. Wk. 340. Practice issues in skill development and role playing; related concerns in psychodramatic intervention.

351. *Social Management/Rural Communities.* I, II. 3 hr. (*Practice Course.*) PR: So. Wk. 340. Practice issues in skill development and community organization and development with special emphasis on rural communities.

352. *Social Planning.* II. 3 hr. (*Practice Course.*) PR: So. Wk. 340. Practice issues in skill development related to social components of comprehensive planning and functional planning systems in health, aging, manpower, social service, and other areas.

354. *Social Agency and Program Administration.* I, II. 3 hr. (*Practice Course.*) PR: So. Wk. 340. Practice issues in skill development in programming, budgeting, organization, staffing, and control of social agencies and programs.

361. *Evaluation Research in Social Work.* 3 hr. (*Research Course.*) PR: So. Wk. 313. Methods of collecting, analyzing and interpreting data on the need for, implementation and effects of social interventions. Examination of the effects of political, ethical and resource variables on the research process.

366. *Strategies of Community Research.* S. 3 hr. (*Research Course.*) PR: So. Wk. 313. Social systems approach to the study of community social phenomena in ecological context. Emphasis on the use of qualitative methods. Students engage in participant observation in natural field settings. (Graded as S or U.)

371. *Social Work With the Aged.* I. 3 hr. (Concentration Course.) Human aging as a problem in social theory, research, and practice.

372. *Concepts and Theories in Social Gerontology.* S. 3 hr. (Concentration Course.) PR: So. Wk. 371 or consent. Major conceptual and theoretical perspectives in social gerontology are applied to social work practice for the aged.

374. *Community Mental Health.* I. 3 hr. (Concentration Course.) An overview of the field of mental health which addresses major policy, program, practice, theory, and research issues as reflected in recent reports of the President's Commission on Mental Health. Current federal and state regulations and state plan documents are examined.

375. *Individual Consultation.* I, II, S. 1-3 hr. Individual directed study to develop extensive knowledge in social work areas of student's interest.

376. *Explorations in Primary Prevention.* S. 3 hr. (Concentration Course.) PR: So. Wk. 374 or consent. This course explores varying conceptual approaches to primary prevention, the social science theories and research on which they are based, and their adaption to major modes of social work practice. Specific substantive knowledge problems are addressed.

377. *Introduction to Family Social Work.* I. 3 hr. (Concentration Course.) Describes the demography of the population at risk, identifies family theory, major programs, and services and policies. Examines gaps in services and major styles of family intervention in social work roles.

378. *Family Victimology.* S. 3 hr. PR: So. Wk. 377 or consent. The interface of social work practice in family victimology, with emphasis on victim welfare policy and service, victim compensation programs, and victim prevention. Social concern for physical and sexual abuse, battery, and related topics.

379. *Social Work with Couples/Families.* 3 hr. (Concentration Course) PR: So. Wk. 377 or consent. This course explores social work practice focused on couples or families as a unit. Emphasis on intervention models oriented to couple and family relationship counseling and on clinical social work techniques.

380. *Special Topics.* I, II, S. 3 hr. Topics include: (A) Statistics for Social Work Practice; (B) Methods of Data Collection; (C) Computer Applications; (D) Family Sexuality; (E) Service Strategies of Aging; (F) Health Planning and Policy; (G) Program and Practice Models; (H) Social Work in Health Care.

381. *Social Work in Health Settings.* I. 3 hr. PR: So. Wk. 374. Comprehensive strategies for serving clients with physical and/or emotional problems and their families with an emphasis on direct practice approaches. Practice in traditional and non-traditional settings is examined.

441. *Advanced Practice Affecting Individuals, Families, and Small Groups.* I, II. 3 hr. (Practice Course.) PR: So. Wk. 340 or consent. This course includes: (a) foundation course work in social work methods; (b) an emphasis in direct social work practice; and (c) practice experiences in social service delivery for employment and/or field placement opportunities.

481. *Advanced Field Instruction 1.* I, II, S. 5-14 hr. PR: Consent. Graduate field instruction in selected settings under the general direction of the faculty.

482. *Advanced Field Instruction 2.* I, II, S. 5-14 hr. PR: Consent. Graduate field instruction in selected settings under the general direction of the faculty.

497. *Research.* I, II, S. 1-15 hr.

SOCIOLOGY AND ANTHROPOLOGY

Ronald Althouse, Chairperson of the Department

423 Hodges Hall

Degree Offered: Master of Arts

Graduate Faculty: Members: Althouse, Ball, Curry, Foss, Hall, Nichols, Paterson, Starr, and Stebbins. Associate Members: Levine and Maggard.

The Department of Sociology and Anthropology offers a program of study in applied social research leading to the degree of master of arts (M.A.). The program is designed for students who seek sound training in research methods, either as preparation for more advanced training in a Ph.D. program, or as a basis for a career in applied social research. The M.A. curriculum emphasizes the interplay between substantive knowledge in some area of expertise, social science models, and research methods in solving problems. Students are thus prepared equally to enter an academic social science career or a career as a research social scientist in the public or private sector.

Admission. Applicants for admission to graduate study must have a bachelor's degree from an accredited institution. Students who do not have adequate background in sociological theory, methods, and statistics may be required to take remedial work. Applicants are required to submit transcripts from their undergraduate institutions, three letters of recommendation, and recent Graduate Record Examination aptitude scores (the appropriate advanced GRE test score is recommended). Foreign students for whom English is not the native language are required by the University to submit "Test of English As a Foreign Lanaguage" (TOEFL) scores and may be required to participate in the University's language orientation sessions.

Applications should be completed by May 1 for admission to the first semester (April 1 if an assistantship is sought), and by November 15 for admission to the second semester. Full-time students who are admitted as special provisional students are required to complete 12 hours of approved course work with a B average or better within a year. Students who fail to do so are suspended. Each spring the departmental graduate committee assesses all students and determines who will continue in the program, with or without assistance. Normally, assistance is for no more than two years.

Degree Requirements. All students in the 36-hour, two-year program are required to take courses in survey methods (three hours), library and computer resources (three hours), qualitative methods (three hours), and data analysis (six hours). Students also participate in two seminars, one in social systems (three hours) and another in social policy (three hours).

All students select three additional courses (nine hours) which vary depending on the student's area of concentration, and they write either a thesis or applied problem report (six hours).

The thesis and applied problem options are identical, except that, in the thesis option, one of the electives is replaced by an advanced theory tutorial relevant to the student's thesis problem, the completed applied problem report becomes an internal document of the Department of Sociology and Anthropology. The thesis becomes a document housed in the WVU Library. The applied problem report normally pertains to an issue of interest to public or private sector decision makers, whereas the thesis may pertain to a sociological problem more pertinent to academic social science than to the needs of decision makers. In both options, the student, in consultation with his or her program committee, chooses electives either in the department or

elsewhere in the University as a basis for gaining expertise in some specific area of concentration.

Among the possible areas of concentration are aging and gerontology, gender studies, community development, complex organization, criminal justice, education, health care delivery, and occupational safety.

Five-Year B.A./M.A. Program. This special option is available to WVU undergraduate sociology and anthropology majors with a grade-point average of 3.0. By taking nine hours of specified graduate work as elective credit during the senior year, students can complete a 30-credit M.A. in only one year of full-time study. (However, students cannot hold an assistantship and still complete the degree in one year.) Contact the department chairperson for more details.

Sociology and Anthropology (Soc. & A.)

201. *Sociological Theory.* II. 3 hr. PR: 6 hr. Soc. & A. and senior standing or consent. Systematic analysis of major sociological theories viewed from the historical perspective and in terms of current research.
202. *Deviant Behavior.* II. 3 hr. PR: 6 hr. Soc. & A. or consent. Examination of the processes by which "deviance" is defined in society, and the methods of social control attempted. Provides a critical understanding of society from the perspective of those defined as "outsiders"—criminals, addicts, etc. (Not offered in 1990-91.)
204. *Complex Organizations.* I or II. 3 hr. PR: 6 hr. Soc. & A. or consent. The structure and functioning of large-scale, bureaucratic organizations, including studies of industrial organizations, prisons, hospitals, government bureaus, and the military in contemporary society.
205. *Class, Status, and Power.* I or II. 3 hr. PR: 6 hr. Soc. & A. or consent. Analysis of various systems of social inequality. Emphasis on empirical studies describing social class system, distribution of status and power, and patterns of social mobility in America. (Not offered 1990-91.)
211. *Social Research Methods.* I, II. 3 hr. PR: Soc. & A. 1 or 5 or consent. Logic of social research, elements of research design, and problems of measurement, with emphasis on survey research methodology and data analysis.
222. *Community Development.* II. 3 hr. PR: Soc. & A. 122, 131, or 140, or consent. Application of sociological knowledge of structure of communities for planning programs and services. Emphasis on techniques of organizing efforts for community change in developing nations.
223. *Sociology of Rural Life.* I or II. 3 hr. PR: Soc. & A. 1 or consent. Social aspects of rural living. Characteristics of rural population, social structure, and institutional arrangements: family, community, education, religion, recreation, health, welfare, and local government. (Not offered 1990-91.)
230. *The Criminal Justice System.* II. 3 hr. PR: Soc. & A. 132 or consent. A sociological introduction to the criminal justice system. Analysis of police work, court activities, and corrections within the context of American social organization and societal definitions of crime and justice.
232. *Sociology of Education.* I. 3 hr. PR: Soc. & A. 1 or consent. Education as a social institution, cultural and class influences on education, social roles and career patterns in the school system, the school and problems of the community. (Also listed as Ed. F. 300.)
233. *Sociology of Work and Work Places.* I. 3 hr. PR: Soc. & A. 1 or consent. Explores the significance of work and work relations in contemporary society. Emphasis is given to the analysis of employment settings including industrial organizations.

253. *Religion, Magic, and Healing*. I. (Alternate Years.) 3 hr. PR: 6 hr. Soc. & A. or consent. Symbolism, magic, ritual, shamanism, sorcery, and concepts of sin and salvation related to peasant and tribal cosmologies will be examined as causes of and remedies for suffering in traditional and modern contexts.

255. *Anthropological Theory*. II. 3 hr. PR: 6 hr. Soc. & A. or consent. Theoretical landmarks in early and modern anthropology. Includes British functionalism, psychological anthropology, French structuralism, and twentieth-century evolutionism in the United States.

258. *Medical Anthropology*. (Alternate Years.) 3 hr. PR: 6 hr. Soc. & A. or consent. Health and disease, diagnosis, and healing in cross-cultural perspectives; analyses of social, cultural, political, and economic factors in modern and traditional medical systems.

261. *Issues in Crime and Justice*. I or II. 3 hr. PR: Consent. Senior seminar on crime and the social organization of justice. Special focus on problems of professionals in prevention, enforcement, corrections, and institutional reform. Emphasis on recent research, emerging trends, and key policy choices.

262. *Youth and Social Change*. I or II. 3 hr. PR: 6 hr. Soc. & A. or consent. A structural-historical approach to the study of youth as both product and agent of social change. Emphasizes concepts of human development, life course transition, age stratification, birth cohort, lineage, historical period, and sociocultural generation. (Not offered in 1990-91.)

271. *Sociology of Mental Health and Disorder*. I. 3 hr. PR: 6 hr. Soc. A or consent. Focuses on epidemiological studies of mental disorders and stress-related illnesses. Includes mental health needs of special populations such as minorities, women, youth, elderly, Vietnam veterans, etc. Discusses mental health policies such as deinstitutionalization.

290. *Special Topics*. I, II, S. 1-3 hr. PR: 6 hr. Soc. & A. or consent. Topics change so students may enroll more than once.

291. *Honors Seminar*. I or II. 1-3 hr.

293. *Independent Study*. I, II, S. 1-6 hr. per sem. PR: 3.0 grade-point average and written departmental permission. Directed reading or research for students desiring work not available in regular course offerings.

311. *Survey Research Methods*. I. 3 hr. PR: Soc. & A. 211 and Stat.101 or consent. Provides students with an overview of survey research including problem definition, research design, sampling, measurement, instrument construction, project management, ethical considerations, and report writing.

313. *Qualitative Methods*. I. 3 hr. Provides students with supervised field experiences in interviewing, participant observation, and other methods of qualitative data gathering, analysis, and presentation.

317. *Data Analysis*. II. 3 hr. PR: Stat. 101 or equiv. Using social science survey data, this course integrates statistics, computer usage, and social science theory to examine alternative methods of analyzing social science data. Makes extensive use of SPSS software package.

318. *Data Analysis*. I. 3 hr. PR: Soc. & A. 317. Continuation of Soc. & A. 317.

319. *Microcomputer Applications*. I. 1 hr. A directed tutorial in selected social science applications of microcomputer use with emphasis on production of research reports. (Soc. & A. majors only.)

322. *Contemporary Sociological Theory*. I or II. 3 hr. Review of recent trends and orientations in sociology. Theory construction, typologies, mathematical models, and the relationship between theory and research. Review of current literature.

323. *Death and Dying*. 3 hr. PR: Graduate status. Sociological and anthropological perspectives on death and dying. Examines sociopsychological and structural factors supporting the beliefs and practices associated with the institution of death, both historically and in contemporary society. (Not open to students with credit for Soc. & A. 123.) (Not offered 1990-91.)

372. *Sociology of Health*. II. 3 hr. PR: Soc. & A. 125 or consent. A seminar focusing upon current issues in medical sociology.

390. *Special Topics*. I, II. 1-3 hr. A graduate course offered as the need arises. Topics change so students may enroll more than once.

391. *Seminar*. I, II. 3-9 hr.

393. *Independent Study*. I, II, S. 1-9 hr. PR: Written departmental consent. Directed reading and/or research in a specialized area of interest.

394. *Thesis or Applied Problem Research*. I, II, S. 1-6 hr.

395. *Field Work*. I, II, S. 1-6 hr. PR: Departmental consent. Supervised field work.

490. *Teaching Practicum*. I, II, S. 1-6 hr.

497. *Research*. I, II, S. 1-15 hr.

SPECIAL EDUCATION

Wilfred D. Wienke, Program Coordinator

504 Allen Hall

Degree Offered: Master of Arts, Area of Emphasis for Doctor of Education

Graduate Faculty: Members Ludlow, Lombardi, G. Nardi, W. Wienke, and Woodrum.

Associate Members Doherty, Fitzgerald, Heitzenroder, Meikamp, Savage, and C. Wienke.

The program leading to the M.A. in special education is designed to prepare master-clinical teachers of special education children and adults and to provide initial training for the preparation of future supervisors and administrators of public-school special education programs. The Division of Education awards the certificate of advanced study and the doctor of education; both may include an emphasis on special education. The post-master's special education track leading to the certificate of advanced study is individually prescribed, designed to prepare persons for positions as program specialists, consultants, supervisors, and administrators of programs or agencies providing special education or associated special services. The Ed.D. with emphasis in special education is an individually prescribed program designed to prepare persons for roles in special education personnel preparation, supervision, administration, and applied research. The programs also prepare professionals for emerging roles associated with interdisciplinary services to persons requiring special education, resources, or support for enhanced development. A particular focus of the program is the delivery of services in rural areas.

All applicants must comply with WVU general requirements and requirements of the College of Human Resources and Education and the special education program. The requirements are based on the 1985 policy 5100 *Standards for Certification*.

M.A. Program Options

- Behavioral disorders K-12**
- Early intervention (pre-school) special education**
- Gifted education (K-8 and 5-12)**
- Mentally impaired (mild and moderate)**
- Severe/profound handicaps**
- Specific learning disabilities K-12**

Admission Requirements

Students are admitted as regular, provisional, or non-degree students as follows:

- **Regular status:** The individual who meets the admission requirements is granted regular status as a certification and degree seeking student;
- **Provisional status:** The individual who has an earned baccalaureate degree from a regionally accredited college or university but who does not meet admission requirements may be granted provisional status in the program. This status allows the student an opportunity to remediate deficiencies in grade-point average in order to achieve regular status. This status is most commonly afforded students with either no or insufficient training in education;
- **Non-degree status:** The individual who has an earned baccalaureate degree and teaching certificate from a regionally accredited college or university but who does not seek the master's degree may be admitted as a non-degree student, which allows the student to take courses for professional development and for additional professional endorsement.

Full status admission to the programs occurs when the following admission criteria have been met:

1. An earned baccalaureate degree from a regionally accredited college or university.
2. A minimum grade-point average of 2.5.
3. Teaching certification in early or elementary education.

Certification

For certification in K-12 programs, holders of a valid professional teaching certificate for elementary education or early childhood education must fulfill the core area requirements and the teaching certification requirements for their program area. Holders of professional teaching certificates in other areas, such as secondary education, must achieve an acceptable level of performance, as designated by the West Virginia Department of Education, on the multi-subjects content specialization test and fulfill the core area requirements and the teaching certification requirements for their program area. Students seeking certification in gifted must hold a valid professional teaching certificate for elementary or secondary education and complete a practicum in gifted at the same level as the professional teaching certificate, plus complete certification requirements for their program area. Certification is either K-8 gifted or 5-12 gifted.

Students who do not have a valid professional teaching certificate but who want certification in the various special education areas of specialization must meet the following criteria:

1. Students must achieve an acceptable level of performance, as determined by the West Virginia Department of Education and/or the College of Human Resources and Education, on the pre-professional skills test and the multi-subjects content specialization test.

2. Students must satisfy the teaching certification requirements for their program area, including the core courses.

Students who do not achieve an acceptable level of performance on the multi-subjects content specialization test may take this test a second time. If they do not achieve the requisite score on the second try, they will no longer be considered candidates for the program.

Students who do not meet skill/proficiency score requirements for admission may choose to avail themselves of the numerous remediation options available on campus. These include the Reading Clinic, the Micro-Computer Laboratory, and the Learning Center.

Performance is assessed during course work and practicum. A student who fails to achieve an acceptable level of performance in practicum will have his or her individual performance deficits reviewed and will be given the opportunity to repeat practicum once; such repetition may occur following completion of an indicated remediation and/or additional instruction. A student who does not meet acceptable levels of performance in the second practicum assignment is asked to withdraw from the program.

Retention in a program requires an overall 3.0 GPA.

Written Comprehensive Examination

Satisfactory completion of a written comprehensive examination is required for a master's degree in the program areas of mentally impaired (mild and moderate), specific learning disabilities, behavioral disorders, and gifted education. Those students who entered a special education master's degree program prior to 1985 should refer to the program requirements outlined in the graduate catalog for the year when they entered the program.

Applicants interested in one of the special education program areas should contact the special education chairperson for specific information on schedule and location of courses.

Curricula for Special Education

Master of Arts (36 Semester Hours Minimum)

A. Core Area Requirements (BD, LD, MI)	Hours
(12 Semester Hours in All Master Degree Programs)	
Sp. Ed. 250—Survey of Exceptional Children and Adults	3
Sp. Ed. 260—Curriculum and Methods for Special Education	3
Coun. 305—Theory and Practice of Human Appraisal	3
Psych. 281—Abnormal Psychology or	
Psych. 263—Introduction to Personality or	
Psych. 264—Psychology of Adjustment	3
SPA 250 or 350—Speech & Lang. Disorders Assessment-Remediation	3
Total	15
B. Teacher Certification Mentally Impaired: Mild/Moderate Area Requirements	
Sp. Ed. 255—Introduction to Mental Retardation	3
Sp. Ed. 305—Mathematics for the Mentally Retarded	3
Sp. Ed. 306—Reading for Mentally Retarded Children	3
Sp. Ed. 487—Practicum: Mentally Impaired	3-6
Total	12-15
Planned Electives—(minimum for degree)	6-9

C. Teacher Certification Learning Disabilities Area Requirements

Sp. Ed. 330—Introduction to Specific Learning Disabilities	3
Sp. Ed. 331—Evaluative Techniques in Specific Learning Disabilities	3
Sp. Ed. 332—Teaching Strategies of Specific Learning Disabilities	3
Rdng. 342—Reading Diagnosis and Prescription in Learning Disabilities	3
Sp. Ed. 487—Practicum: Learning Disabilities	<u>3-6</u>

Total 15-18

Planned Electives—(minimum for degree) 3-6

D. Teacher Certification Behavioral Disorders Area Requirements

Sp. Ed. 340—Introduction to Behavioral Disorders	3
Sp. Ed. 341—Behavioral Dynamics in the School and Community	3
Sp. Ed. 342—Curriculum and Methods for the BD Child	3
Sp. Ed. 487—Practicum: Behavioral Disorders	<u>3-6</u>

Total 12-15

Planned Electives—(minimum for degree) 6-9

E. Teacher Certification Gifted Education Area Requirements

Sp. Ed. 250—Survey of Exceptional Children and Adults	3
Coun. 305—Theory and Practice of Human Appraisal	3
Sp. Ed. 370—Introduction to the Gifted	3
Sp. Ed. 371—Educational Development of the Gifted	3
Sp. Ed. 372—Strategies for Instruction of the Gifted	3
Sp. Ed. 481—Seminar: Interdisciplinary Problem Solving	1
Sp. Ed. 487—Practicum: Gifted Education	<u>3-6</u>

Total 19-22

Planned Electives—(minimum for degree) 14-17

F. Teacher Certification Severe/Profound Handicaps Area Requirements

Sp. Ed. 320—Curriculum: Severe Handicaps	3
Sp. Ed. 322—Characteristics and Methods: Physical Handicaps	3
Sp. Ed. 323—Teacher/Parent Consultation: Handicapped Populations	3
Sp. Ed. 324—Classroom-based Communication Intervention: Developmental Handicaps	3
Sp. Ed. 325—Secondary/Adult Programming: Severe Handicaps	3
Sp. Ed. 327—Assessment: Developmental Handicaps	3
Sp. Ed. 328—Instructional Programming: Developmental Handicaps	3
Ed. P. 350—Principles of Behavior Modification	3
Sp. Ed. 487—Practicum: Severe and Profound Handicaps	<u>6</u>

Total 30

Planned Electives—(minimum for degree) 6

G. Teacher Certification Preschool Handicaps Early Intervention Area Requirements

C&I 380—Early Education Curriculum: Preschool Handicaps	3
Sp. Ed. 322—Characteristics and Methods: Physical Handicaps	3
Sp. Ed. 323—Teacher/Parent Consultation: Handicapped Populations	3
Sp. Ed. 324—Classroom-based Communication Intervention: Developmental Handicaps	3
Sp. Ed. 326—Program Management: Young Handicapped Children	3
Sp. Ed. 327—Assessment: Developmental Handicaps	3
Sp. Ed. 328—Instructional Programming: Developmental Handicaps	3
Ed. P. 391—The Growing Years	3
Sp. Ed. 487—Practicum: Early Intervention	<u>6</u>

Total 30

Planned Electives (minimum for degree) 6

H. Problem or Thesis Area Requirements

Stat. 311—Statistical Methods or	
Ed. P. 320—Introduction to Research	3
Sp. Ed. 395—Problem in Special Education or	
Sp. Ed. 497—Research	3-6
Sp. Ed. 480—Seminar	3
 Total	9-12
 Elective Requirements	12-15

I. Approved Electives

Coun. 305, 464
C&I 330, 333, 340
Ed. F. 320, 340
Ed. P. 300, 320, 330, 333, 341, 342, 343, 350, 420, 440, 450, 451
Psych. 263, 264, 271, 281, 282, 322, 423
Rdng. 283, 321, 324, 325, 330, 331, 340, 342
Sp. Ed. 255, 281, 305, 306, 322, 323, 324, 330, 331, 340, 341, 342, 365, 381, 395, 480, 481, 487, 496
Stat. 311, 312
Others by approval of adviser.

Certificate of Advanced Study (C.A.S.)

All applicants must comply with the requirements of WVU, the College of Human Resources and Education, and the special education program.

Additional admissions requirements are as follows:

1. Completion of a master's degree related to special education.
2. Submission of scores of the Miller Analogies or the Graduate Record Examination aptitude test.
3. Evidence of successful appropriately selected work experience.
4. Three positive letters of recommendation.
5. Statement of goal of program study.
6. Plan of study approved by adviser.

Areas of Specialization

Advanced study may be in any one or combination of areas represented in the program including: (1) behavioral disorders; (2) gifted education; (3) mental impairment; (4) severe and profound handicaps; (5) specific learning disabilities; and (6) early intervention special education.

Program of Studies

Courses/Course Areas	Hours
Sp. Ed. 480—Seminar in Special Education	3
Sp. Ed. 365—Administration and Supervision	
of Programs for Exceptional Children	3
Individually prescribed course work in	
special education including goal related areas	18
Research including Sp. Ed. 491—Advanced Study	
Project in special education	6
	Minimum
	30

Doctor of Education (Ed.D.)

All applicants must comply with the requirements of WVU, the College of Human Resources and Education, and the Special Education Program.

Additional entrance requirements are as follows:

1. Completion of a master's degree, preferably in special education.
2. Graduate grade-point average of 3.5.
3. Three letters of reference addressing the candidate's past performance and qualities which would make the person suitable for doctoral-level study.
4. Work experience in special education or with exceptional persons.
5. Submission of Graduate Record Examination or Miller Analogies scores in support of potential for success in doctoral-level study.
6. Well defined goal statement.

Admissions are open year round and inquiries should be addressed to:

Chairperson, Doctoral Admissions Committee

Special Education Program

College of Human Resources and Education

West Virginia University

P.O. Box 6122

Morgantown, WV 26506-6122

Program of Study

Programs of study comply with all applicable institutional requirements, but typically they include course work in excess of minimum requirements because of the clinical nature of special education. Programs are designed by the doctoral student, the student's adviser, and the doctoral committee to best meet the student's career goals.

The leadership training provided through this program of studies draws on the many available strengths and resources of a major university. Development of research skills is a major focus of the program, along with advanced training related to the education, development, and habilitation of persons with exceptional needs. Normally, students take course work in a number of programs and colleges in order to take advantage of available interdisciplinary resources. The program encourages study and involvement with faculty from a broad range of disciplines in order to best prepare doctoral students to meet their individual career aspirations as leaders in special education.

Special Education (Sp. Ed.)

250. *Survey of Exceptional Children and Adults.* 3 hr. PR: Consent. Introduction to all areas of exceptionality. Definition, psychological and educational characteristics, and social and vocational adjustment.
255. *Introduction to Mental Retardation.* 3 hr. PR: Consent. Historical, etiological, social, educational, and vocational aspects of mental retardation.
260. *Curriculum and Methods for Special Education.* 3 hr. PR: Sp. Ed. 250, 255 and/or consent. Organization of instruction and adaptation of teaching methods in the several curricula areas and the construction of materials.
262. *Curriculum and Methods for the Trainable Mentally Retarded.* 3 hr. PR: Sp. Ed. 250, 255 and/or consent. Special problems of curriculum development for the trainable child and adult and development of original construction of curricula materials.

280. *Student Teaching Clinical Experience in Special Education.* 1-6 hr. PR: Consent. Student teaching with the mentally retarded. (Graded as S/U.)

281. *Special Problems and Workshop in Special Education.* 2-4 hr. PR: Consent. To take care of credits for special workshops and short intensive unit course on methods, supervision, and other special topics.

305. *Mathematics for the Mentally Retarded.* 3 hr. PR: Consent. Materials and methods for teaching mathematics to the mentally retarded child.

306. *Reading for Mentally Retarded Children.* 3 hr. Designed especially for majors in special education. Emphasizes the techniques, methods, and materials most effective for teaching reading to mentally retarded.

320. *Curriculum: Severe Handicaps.* 3 hr. PR: Consent. Focuses on evaluation of curricula and programs for severely and profoundly handicapped students. Task analysis and programming of longitudinal skill sequences are discussed for the following skill areas: pre-academics, academics, motor, self-help, and social. (Consult program for course offering.)

322. *Characteristics and Methods: Physical Handicaps.* 3 hr. PR: Consent. Characteristics and educational implications of physical, neurological, and sensory impairments along with positioning, handling, and other management strategies, selection, design and use of adaptive equipment, training programs for feeding, toileting, dressing, and motor skills.

323. *Teacher/Parent Consultation: Handicapped Populations.* 3 hr. PR: Consent. Focuses on services to handicapped populations beyond direct instruction including inservice training, educational planning conferences, special services, program planning, and parent involvement in education. (Consult program for course offering.)

324. *Classroom-Based Communication Intervention: Developmental Handicaps.* 3 hr. PR: Consent. Design and implementation of training programs to develop primary language/communications skills in classroom-based programs for at-risk children, handicapped infants and preschoolers, and persons with severe disabilities.

325. *Secondary/Adult Programming: Severe Handicaps.* 3 hr. PR: Consent. Focuses on the education of secondary-level and adult severely handicapped persons. Methods and materials in areas of vocational training, home living, community living, recreational and leisure skills, and sex education. (Consult program for course offering.)

326. *Managing Programs: Young Handicapped Children.* 3 hr. PR: Consent. Management skills to serve young handicapped and at-risk children, including home-based, center-based, self-contained, and mainstreamed models.

327. *Assessment: Developmental Handicaps.* 3 hr. PR: Consent. Principles and practices of assessment, legal and ethical issues, individualized educational programs for at-risk children, handicapped infants and preschoolers, and persons with severe disabilities.

328. *Instructional Programming: Developmental Handicaps.* 3 hr. PR: Consent. The design, delivery, and evaluation of instruction for at-risk children, handicapped infants and preschoolers, and persons with severe disabilities.

330. *Introduction to Specific Learning Disabilities.* 3 hr. PR: Consent. Historical, etiological, educational, and legislative aspects of, and multidisciplinary approaches to, the learning disabled child.

331. *Evaluation Techniques in Specific Learning Disabilities.* 3 hr. PR: C&G 305, Sp. Ed. 330, and consent. Administration, interpretation, report writing, and educational implications of selected testing procedures appropriate to the diagnosis of learning disabilities.

- 332. *Teaching Strategies in Specific Learning Disabilities.* 3 hr. PR: Sp. Ed. 330, 331, consent. Curriculum planning, informal diagnosis, techniques, teaching strategies in specific areas, opportunities to use strategies in student designed programs.
- 340. *Introduction to Behavioral Disorders.* 3 hr. PR: Consent. Historical trends in the education of the behaviorally disordered child. Educational and behavioral management techniques and trends for the future.
- 341. *Behavioral Dynamics in the School and Community.* 3 hr. PR: Sp. Ed. 340 and/or consent. Theories of behavioral dynamics, including several distinct approaches, which relate to specific problems in the school, home, and community. Agencies available to the behaviorally disordered child and the child's family.
- 342. *Curriculum and Methods for the Behaviorally Disordered Child.* 3 hr. PR: Sp. Ed. 340 and/or consent. Development of appropriate curriculum based upon individual needs of the child. Practical application of a variety of methods used in the instruction of the behaviorally disordered child in the classroom. Research and data collection case studies.
- 365. *Administration and Supervision of Programs for Exceptional Children.* 3 hr. PR: Consent. Administration and supervision with attention to: selection and placement procedures; facilities and equipment; local, state, federal legislation; and philosophy and recent research. (Consult program for course offering.)
- 370. *Introduction to the Gifted.* 3 hr. PR: Sp. Ed. 250 or consent. An introductory course concerning characteristics of gifted and talented children and implications these factors have for education. Included will be definition, characteristics, history and philosophy of special programs, identification procedures, and development of program prototypes.
- 371. *Educational Development of the Gifted.* 3 hr. PR: C&G 305, Sp. Ed. 370 or consent. Analysis of the educational and psychological development of gifted individuals as evidenced through research studies; the application and interpretation of the Structures of Intellect model of multifactor intellect; and the interrelatedness between creativity and giftedness.
- 372. *Strategies for Instruction of the Gifted.* 3 hr. PR: Sp. Ed. 371 or consent. Application of creativity and curriculum theories and evaluation methodology to the development of qualitatively different educational experiences for the gifted. Will include the writing of Individual Education Programs (IEP).
- 381. *Special Topics.* 1-6 hr. PR: Consent. Special topics or research in mental retardation and in exceptional children and adults.
- 391. *Advanced Topics.* 1-6 hr.
- 395. *Problem in Special Education.* 3 hr. Research for master's degree in special education.
- 397. *Master's Degree Research or Theory.* 1-15 hr.
- 480. *Seminar. I, II, S.* 1-6 hr. PR: Consent. Special topics concerned with the educational, sociological, and psychological aspects of special education.
- 481. *Problem-Solving for Gifted Students.* 1 hr. PR: Consent. Themes and issues are addressed across sets of disciplines, enabling students to comprehend the character and elements of problem-solving, the similarities and differences between each discipline's application, and use of various problem-solving approaches.
- 487. *Practicum.* 1-12 hr. PR: Consent. Internship, advanced student teaching in each certification area, and administration and supervision practicum. (Graded as S/U.)

490. *Teaching Practicum.* 1-3 hr. PR: Consent. Intended for graduate students with college teaching responsibility. Provides a supervised experience in a teaching situation. (Graded as S/U).

491. *Advanced Study Project in Special Education.* 3-6 hr. Research for the program leading to the Certificate of Advanced Study in Special Education. (Consult program for course offering.)

496. *Advanced Seminar.* 1-6 hr. PR: Consent. Designed to permit graduate students an opportunity to present research to the assembled faculty and graduate study body. (Graded as S/U.) (Consult program for course offering.)

497. *Research.* 1-15 hr.

498. *Thesis.* 2-4 hr. PR: Consent. (Graded as S/U.)

499. *Colloquium in Special Education.* 1-6 hr. PR: Consent. For graduate students not seeking course work credit, but who wish to participate in academic programs.

SPEECH PATHOLOGY AND AUDIOLOGY

Dennis M. Ruscello, Chairperson

805 Allen Hall

Degree Offered: Master of Science, Area of Emphasis for Doctor of Education

Graduate Faculty: Members Atkins, Koay, Lass, Lundein, Ruscello, Shuster, St.Louis, and Woodford.

Master of Science (M.S.)

Students applying for programs leading to a degree in speech pathology and audiology must comply with general WVU requirements and the requirements of the College of Human Resources and Education and of the Department of Speech Pathology and Audiology.

The Speech Pathology and Audiology Graduate Affairs Committee accepts those applicants they believe will be successful in the graduate program. The number of applicants accepted depends upon the number of qualified applicants, the size of the speech pathology and audiology graduate faculty, and the facilities available for acceptable academic, clinical, and research training.

The Master of Science in speech pathology and audiology is a competency-based program. Students are expected to achieve a minimum competency level of B or S in each required course. If a student receives a grade of C or U (or lower) in a required course, he/she must meet with his/her academic adviser and/or academic graduate committee before beginning additional course work. The adviser or committee will recommend the appropriate steps to meet the minimum standards of professional competency.

In addition to the requirements listed under the Human Resources and Education section, the M.S. in speech pathology and audiology requires:

- A minimum of 42 semester hours of approved graduate courses (including six hours for clinical practicum) in speech and hearing sciences, speech pathology, audiology, and other related areas to attain professional competence;

- Three additional semester hours of clinical practicum during each regular semester and two additional semester hours of practicum during the summer; six of these hours count toward the 42 semester hour requirement.

- A 3.0 grade-point average for all courses taken for credit toward the graduate degree.

- Successful performance during the last semester of graduate study on final examinations according to departmental standards.
- Demonstration of professional competence in speech and/or hearing as measured by fulfillment of the academic and clinical practicum requirements established by the faculty.
- A minimum of five consecutive semesters (including summer sessions) is required for master's candidates with a background in speech and hearing. For candidates without a background in speech and hearing, a minimum of seven semesters is required for completion of the master's degree.

Doctor of Education with emphasis in Speech Pathology and Audiology (Ed.D.)

Curricula for the Doctor of Education (Ed.D.) with emphasis in speech pathology and audiology are tailored to meet the particular needs of students and their professions. Interested students should contact the chairperson of speech pathology and audiology.

Accreditation

The Department of Speech Pathology and Audiology is accredited by the Educational Standards Board (ESB) of the American Speech-Language-Hearing Association for both the speech pathology and audiology training programs, the only accredited programs in West Virginia for these subjects.

Speech Pathology and Audiology (SPA)

210. *Manual Communication.* I. II. 3 hr. PR: Consent. Development of skills needed to communicate in sign language. Includes the manual alphabet, basic number concepts, and the basic vocabulary of traditional American signs.
212. *Intermediate Manual Communication.* II. 3 hr. PR: SPA 210 or consent. Improve skills needed to communicate in sign language. Includes increasing sign language vocabulary, practicing fingerspelling, and communicating with signs.
218. *Introduction to Identification Audiometry.* I. 3 hr. PR: SPA 50 or 250; 152; 153; 154; or consent. Disorders of hearing and identification audiometry for infants, pre-school and school age children. Basic introduction to industrial hearing conservation.
223. *Aural Rehabilitation.* II. 3 hr. PR: SPA 220 or consent. Rehabilitative approaches to management in the auditorially handicapped individual. Medical, audiological, and social aspects of rehabilitation. Procedures of speech reading and auditory training will be examined and evaluated.
232. *Advanced Clinical Methods: Speech.* II. 3 hr. PR: SPA 132 or consent. Specific clinical procedures in speech pathology. Assessment and treatment strategies appropriate for various communicatively handicapped populations, report writing skills, referrals to professionals, and client-clinician-supervisor relationships.
233. *Advanced Clinical Methods: Audiology.* II. 3 hr. PR: SPA 133 or consent. Basic audiometric techniques. Pure tone testing, speech audiometry, masking, audiogram interpretation, and report writing.
243. *Audiological Assessment Procedures.* I. 4 hr. PR: Consent. Advanced application of audiometric evaluation procedures. Assessing hearing handicap and planning appropriate rehabilitation.

250. *Speech-Language-Hearing: Development-Disorders.* I, II, S. 3 hr. (Non-majors). PR: Consent. Discussion of normal processes and disorders of speech, language, and hearing in children and adults. Orientation course for students and teachers in early childhood, elementary, and secondary education, language arts specialists, psychologists, and rehabilitation specialists.

251. *Cleft Palate and Voice Disorders.* II. 3 hr. PR: SPA 50 or consent. Normal vocal production and embryological development of the face and palate considered. Nature and etiology of disorders of cleft palate and voice, diagnosis, and general goals of therapy.

252. *Stuttering.* I. 3 hr. PR: SPA 50. Development of normal fluency versus nonfluency examined in addition to the nature, etiology, theories, classification, and prognostic indicators of stuttering. General formal and informal assessment, treatment, and counseling procedures.

253. *Cerebral Palsy and Aphasia.* I. 3 hr. PR: SPA 50 or consent. Speech and language disorders related to cerebral injury, with emphasis on nature and etiology of cerebral palsy and aphasia. Diagnosis and general goals of therapy.

254. *Language Acquisition and Behavior.* I. 3 hr. Normal processes involved in the acquisition of language, including the development of phonological, semantic, and syntactical systems. Application of these processes to the diagnosis and treatment of language disorders.

257. *Public School Clinical Programs.* I. 3 hr. PR: SPA 50 or consent. Organization and structure of clinical programs in public school settings. Discussion of state and federal regulations, case selection, scheduling, program planning, and other administrative matters.

260. *Language Disorders In Children.* II. 3 hr. PR: SPA 254 or consent. Assessment and remediation procedures are examined. Utilization of current tests and analysis procedures in diagnosis are presented. Treatment approaches include commercially available programs and student-developed treatment strategies.

263. *Preschool Deaf Child.* I. 3 hr. PR: Consent. Importance of early detection and education, language development of congenitally deaf child, and parents' role in early childhood education.

265. *Parent Programs: Communicatively Disordered Children.* II. 2 hr. Students will learn to organize and implement parent involvement programs in a variety of settings, interview parents, conduct conferences, utilize appropriate materials, and interact effectively with parents of communicatively handicapped children through lectures and practica.

280. *Oral/Written Skills for Professionals.* II. 3 hr. Designed for improvement of the student's professional skills—specifically oral and written. Emphasis is on report writing, letter writing, resume writing, listening, interviewing, group problem solving, leadership, persuasion, and public speaking.

281. *Special Topics.* I, II, S. 1-6 hr. per sem.; Max. credit 6 hr. PR: Consent. Independent study in speech pathology, audiology, and speech and hearing sciences.

282. *Clinical Practice in Speech.* I, II, S. 1-6 hr. PR: Consent. Supervised diagnosis and therapy of speech disorders.

283. *Clinical Practice in Audiology.* I, II, S. 1-6 hr. PR: Consent. Supervised diagnosis and therapy of hearing disorders.

285. *Hearing Impaired Children in Schools.* S. 3 hr. Audiology in the public school classroom; remediation for the hearing-impaired child.

- 320. *Introduction to Research.* I. 3 hr. PR: Consent. Discussion of research including experimental design and data analysis found in speech/language pathology, audiology and speech and hearing sciences literature. Interpretation and application of findings to communication disorders is emphasized. 3 hr. lec.
- 321. *Structure and Function of the Auditory System.* I. 3 hr. PR: Consent. Detailed study of the gross and microscopic anatomy of the auditory system, and detailed investigation of physiological aspects of auditory sensitivity and acuity.
- 322. *Advanced Audiological Assessment.* I. 3 hr. Various audiological techniques utilized in differential diagnosis of auditory dysfunctioning. Administration and interpretation of diagnostic techniques.
- 323. *Advanced Study: Aural Rehabilitation.* 3 hr. Identification of candidates for aural rehabilitation; evaluating degree of handicap; introduction to speech, language, education, and academic achievement of hearing impaired children; auditory, visual, and combined methods of rehabilitation; aural rehabilitation counseling. 3 hr. lec.
- 324. *Central Auditory Disorders.* 3 hr. PR: SPA 322 or consent. Pathology and audiometric site-of-lesion testing of the central auditory nervous system. 3 hr. lec.
- 325. *Hearing Aids.* I. 3 hr. PR: SPA 322. Electronic design of amplification systems and acoustics analysis of amplification systems. Hearing aid evaluation procedures.
- 326. *Pediatric Audiology.* S. 3 hr. A study of the development of the auditory response and hearing problems of early childhood. Student will learn the construction and application of specialized assessment techniques suitable for the pediatric patient.
- 327. *Pathologies of the Auditory System.* S. 3 hr. PR: Consent. Investigation of the nature and etiology of auditory system pathologies from the external ear to the auditory cortex and their audiological manifestation.
- 330. *Industrial and Environmental Audiology.* II. 3 hr. A study of various noise parameters, instrumentation for noise measurement, and measurement techniques. Effects of noise on man and industrial hearing conservation procedures discussed.
- 340. *Experimental Phonetics.* II. 3 hr. PR: SPA 152 or consent. Discussion of contemporary topics in the speech and hearing sciences, including acoustic and physiological phonetics.
- 341. *Hearing Science.* II. 3 hr. Audiological instrumentation and competency in calibration, maintenance, trouble shooting, minor repair, and use of instrumentation.
- 343. *Neurophysiological Basis of Speech and Language.* I. 3 hr. PR: SPA 154, 253, or consent. General and typographic anatomy of CNS, with special attention to motor and sensory systems as they apply to speech, hearing, and language.
- 344. *Neuropathologies of Speech and Language.* S. 3 hr. PR: SPA 343. Explores methods of identifying and treating speech and language problems associated with nonprogressive and progressive neurological disorders, including cerebral palsy, Parkinson's disease, multiple sclerosis, muscular dystrophy, amyotrophic lateral sclerosis, Bell's palsy, and myasthenia gravis.
- 350. *Speech and Language Disorders: Assessment-Remediation.* I, II. 3 hr. PR: SPA 250 or consent. Familiarizes the student with the following aspects of speech and language disorders: causes, characteristics, assessment, remediation techniques, and their incorporation into individualized educational programs.
- 351. *Advanced Voice Disorders.* I. 3 hr. PR: SPA 251 or consent. Management of vocal behavior involved in functional and organic voice disorders. Etiology and pathogenesis, clinical features, history taking, and development of critical listening skills emphasized.

352. *Advanced Stuttering Disorders.* II. 3 hr. PR: SPA 252 or consent. Course content examines factual information and classifications of stuttering. Formal and informal diagnostic techniques and treatment procedures are detailed for individuals who display primary, transitional, and secondary stuttering behaviors. Patient and family counseling are reviewed.

353. *Advanced Study: Aphasia.* II. 3 hr. PR: SPA 343 or consent. Advanced investigation of the etiology, diagnosis, nature, and therapeutic approaches of aphasia, agnosia, apraxia, and dysarthria.

354. *Language Disorders in Children.* S. 3 hr. PR: SPA 254. Explores assessment and remediation procedures for language disorders in children. Emphasizes "formal" and "informal" language tests, and various treatment approaches, including traditional methods, psycholinguistic teaching procedures, and behavior modification techniques.

355. *Advanced Study: Cleft Palate.* II. 3 hr. PR: SPA 251 or consent. Investigation of the etiology, diagnosis, nature, and therapy approaches of communicative disorders in persons with cleft palate.

356. *Advanced Articulation Disorders.* I. 3 hr. PR: SPA 156 or consent. Explores the merits of various methods of assessing and treating articulation disorders. Prognostic indicators, behavior modification techniques, and distinctive feature analysis are emphasized.

357. *Professional Issues: Speech Pathology-Audiology.* II. 2 hr. PR: SPA 320. Contemporary professional issues in speech-language pathology and audiology, including accountability, private practice, marketing of services, and employment.

360. *Language Disorders in Children: Assessment.* S. 3 hr. PR: SPA 254. Assessment procedures utilized to identify children with language disorders. Standardized tests and non-standardized analysis procedures are introduced.

361. *Language Disorders in Children: Treatment.* S. 3 hr. PR: SPA 360 or consent. Treatment procedures for children with language disorders are presented. Clinician-oriented and client-oriented approaches are emphasized.

382. *Advanced Clinical Practice in Speech.* I, II, S. 1-6 hr. PR: Consent. Emphasis on diagnosis of speech disorders and appropriate therapeutic follow-up. Patient staffing experience in a multi-disciplined environment.

383. *Advanced Clinical Practice in Audiology.* I, II, S. 1-6 hr. PR: Consent. (May be taken in conjunction with SPA 322.) Supervised experience in administration and interpretation of audiological evaluative procedures. Application of therapeutic techniques in aural rehabilitation.

384. *Externship in Speech Pathology/Audiology.* I, II, S. 1-9 hr. Supervised clinical practicum experience in selected work settings to provide students with a concentrated orientation to the professional work place. Coordination and evaluation is under the direction of faculty.

387. *Special Topics.* I, II, S. 1-6 hr. (May be repeated for credit.) PR: Consent. Open to graduate students in speech pathology and audiology who are pursuing independent problems in that field.

480. *Seminar.* I, II, S. 1-6 hr. PR: Consent. Topics vary from semester to semester to meet student needs. Organic speech impairment, speech pathology research, aural rehabilitation research, medical audiology research, etc.

497. *Research.* I, II, S. 1-15 hr.

STATISTICS

Donald F. Butcher, Chairperson of Department of Statistics and Computer Science
311 Knapp Hall

Degree Offered: Master of Science

Graduate Faculty: Members Butcher, Dowdy, Gunel, Harner, Hobbs, Thayne, Townsend, and Wearden. Associate Members Chilko and Petersen.

The Department of Statistics and Computer Science offers a master of science with a major in statistics. The master of science degree is intended to qualify the student to assume a professional role in an educational, industrial, or governmental research project, to teach in a junior or senior college, or to undertake advanced training toward a doctorate in statistics or one of the quantitative fields of science.

Because many students receive baccalaureate degrees from colleges which do not offer undergraduate programs in statistics and because historically statistics has been primarily a field of graduate education, a student does not need a degree in statistics to enter the M.S. degree program in statistics. In fact, a good background in engineering, mathematics, or science is a reasonable preparation for graduate work in statistics.

Two options are available for students seeking a master of science in statistics. The two options are:

1. *Problem Report Option:* At least 36 hours of course work including three hours of credit for a problem report.

2. *Thesis Option:* At least 30 hours of course work including six hours of credit for a thesis.

Students are expected to know the material contained in the following courses upon admission to the program. Otherwise, these deficiencies must be removed as early as possible in the student's degree program.

1. Single and multivariable calculus (Math. 15, 16, 17 or equiv.)
2. Linear or matrix algebra (Math. 241 or equiv.)
3. Probability and statistics (Stat. 201 or equiv.)

Minimum required courses for either option are:

1. Stat. 361, 362, 396.
2. Fifteen hours from Stat. 312, 313, 341, 351, 371, 381.
3. One course from Stat. 441, 451.
4. One course from Stat. 390, 392.

Credit towards the degree requirements is not given for Stat. 311.

All students must pass a final oral examination on the problem report or thesis and on course work. Students are encouraged to request a written examination on foundation material during the first three weeks of the semester in which they hope to graduate. All written examinations are given during the last month of the semester in which they are requested. The final oral examination, for those students passing a written examination on foundation material, has less emphasis on course work. Foundation material for the oral and/or written examination(s) is contained in Stat. 312, 313, 341, 351, 361, 362, 371, and 381.

More information concerning graduate studies may be found in "Graduate Programs in Statistics" available from the Department of Statistics and Computer Science.

Statistics (Stat.)

201. *Introduction to Probability and Statistics.* I, II. 3 hr. PR: Math. 16. Probability, random variables, discrete and continuous probability distributions, joint probability distributions, expected value. The central limit theorem. Point and interval estimation and tests of hypotheses. Chi-square tests, linear regression, and correlation.

212. *Intermediate Statistical Methods.* I, II. 3 hr. PR: Stat. 101 or 201 or equiv. Extension of basic concepts of statistical inference: estimation and hypothesis testing for more than two populations, multiple regression and correlation, curvilinear regression, analysis of variance and covariance.

213. *Introductory Design and Analysis.* II. 3 hr. PR: Stat. 212. Introduction to the linear model, the complete and fractional factorial experiment, and the completely random, randomized complete block, Latin square, and split-plot experimental designs.

221. *Statistical Analysis System (SAS).* I, II. 3 hr. PR: Stat. 101 or 201 or equiv., and C.S. 1 or equiv. Introduction to the use of the Statistical Analysis System (SAS), a statistical computer program. Students will perform statistical data analysis, data file modifications, and statistical report writing.

231. *Sampling Methods.* I. 3 hr. PR: Stat. 101 or 201 or equiv. Methods of sampling from finite populations, choice of sampling unit, and sample survey design. Estimation of confidence limits, and optimum sample size. Single and multistage sampling procedures.

251. *Data Analysis.* II. (Alternate Years.) 3 hr. PR: Stat. 213. Computer analyses of simulated or real unbalanced data using a matrix approach to linear models. The techniques will include least squares analysis of variance and covariance, multiple and polynomial regression, and multiple discrimination.

261. *Theory of Probability.* I. 3 hr. PR or Conc.: Math. 17. Theoretical coverage of probability, random variables, discrete and continuous probability distributions. Expected value, moment generating functions, special probability distributions. Random sampling and distributions of certain functions of random variables. The Central Limit Theorem.

262. *Theory of Statistics.* II. 3 hr. PR: Stat. 261. Theoretical introduction to statistical inference. Properties of estimators and techniques of estimation. Hypotheses testing including the Neyman-Pearson Lemma and likelihood ratio tests. Regression and correlation. Selected topics.

291. *Topics in Statistics.* I, II, S. 3 hr. PR: Stat. 201 or equiv. Advanced study of special topics in statistics.

311. *Statistical Methods 1.* I, II. 3 hr. PR: Math. 3. Statistical models, distributions, probability, random variables, tests of hypotheses, confidence intervals, regression, correlation, transformations, F and Chi-square distributions, analysis of variance and multiple comparisons. (Equiv. to Ed. P. 311 and Psych. 311.)

312. *Statistical Methods 2.* I, II. 3 hr. PR: Stat. 212 or 311 or equiv. Completely random, randomized complete block, Latin square and split-plot experimental designs. Unplanned and planned multiple and orthogonal comparisons for qualitative and quantitative treatments and factorial arrangements. Multiple linear regression and covariance analysis. (Equiv. to Ed. P. 312 and Psych. 312.)

313. *Design of Experiments.* II. 3 hr. PR: Stat. 312 or equiv. Expected mean squares, power of tests and relative efficiency for various experimental designs. Fixed, random, and mixed models. Use of sub-sampling, covariance and confounding to increase power and efficiency.

341. *Applied Multivariate Analysis*. I. 3 hr. PR: Stat. 311 or equiv. Introduction to Euclidean geometry and matrix algebra; multiple and multivariate regression including multiple and canonical correlation; the k-sample problem including discriminant and canonical analysis; and structuring data by factor analysis, cluster analysis, and multidimensional scaling.

351. *Applied Regression Analysis*. I. 3 hr. PR: Stat. 312. Matrix approach to linear and multiple regression, selecting the "best" regression equation, model building, and the linear models approach to analysis of variance and analysis of covariance.

361. *Theory of Statistics 1*. I. 3 hr. PR: Math. 17. Probability and random variables, univariate and multivariate distributions, expectations, generating functions, marginal and conditional distributions, independence, correlation, functions of random variables including order statistics, limiting distributions, and stochastic convergence.

362. *Theory of Statistics 2*. II. 3 hr. PR: Stat. 361. Techniques of point and interval estimation, properties of estimates including bias, consistency, efficiency, and sufficiency; hypothesis testing including likelihood ratio tests and Neyman-Pearson Lemma; Bayesian procedures, analysis of variance and nonparametrics.

371. *Introduction to Exploratory Data Analysis*. I. (Alternate Years.) 3 hr. PR: An introductory statistics course. Basic ways in which observations given in counted and measured form are approached. Pictorial and arithmetic techniques of display and discovery. Methods employed are robust, graphical, and informal. Applications to social and natural sciences.

381. *Nonparametric Statistics*. II. 3 hr. PR: Stat. 311 or equiv. Distribution-free procedures of statistical inference. Location and scale tests for homogeneity with two or more samples (related or independent); tests against general alternatives.

390. *Teaching Practicum*. I, II. 1-3 hr. PR: Consent. Supervised practice in college teaching of statistics.

391. *Advanced Studies in Statistics*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced statistics subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

392. *Analysis of Experiments*. II. 1 hr. PR: Consent. Statistical consulting and data analysis.

396. *Graduate Seminar*. I, II. 1 hr. PR: Consent. It is anticipated that each graduate student will present at least one seminar to the assembled faculty and student body in statistics.

397. *Research in Statistics*. I, II, S. 1-15 hr. PR: Consent.

441. *Multivariate Statistical Theory*. II. (Alternate Years.) 3 hr. PR: Stat. 341, 361 or consent. Euclidean vector space theory and matrix algebra, multivariate normal sampling theory, the theory of the multivariate general linear hypothesis including multivariate regression, MANOVA, and MANCOVA, and the theory of factor analysis.

451. *Linear Models*. II. (Alternate Years.) 3 hr. PR: Stat. 351, 362. Multivariate normal distribution, distribution of quadratic forms, linear models, general linear hypotheses, experimental design models, components of variance for random effects models.

TECHNOLOGY EDUCATION

David L. McCrory, Chairperson

706 Allen Hall

Degrees Offered: Master of Arts, Area of Emphasis for Doctor of Education

Graduate Faculty: Members DeVore, Maughan, McCrory, and Pytlak.

The program includes the study of technology, the relationship of technical systems to the civilization process, and the implications of changes in these systems on the quality of life and the education of citizens. Faculty and students in the program are committed to a continuing investigation of the impact of technology on people and society—including education and the environment. The goal of the program is an increased level of understanding about technical means so as to provide the basis for developing, controlling, directing, and redirecting technical systems for the benefit of humankind. Because the interdisciplinary nature of technology dictates a wide exposure to other disciplines, students are encouraged to take advantage of educational opportunities in other departments of the University community.

Students from all regions of the United States and several other countries are engaged in graduate study at the master's or doctoral level. Their undergraduate preparation varies, ranging from technical fields such as engineering, industrial technology, industrial arts, and journalism, to fields such as speech communication, art, and theology.

The program is involved in the Academic Common Market of the SREB (Southern Regional Education Board). Students from the southern region (thirteen southern states) should inquire about in-state tuition. Graduate assistantships are frequently available at both the master's and doctoral levels. Information is available upon request.

Admission Requirements. All applicants must comply with the general WVU requirements and the requirements of technology education. Admission to the program is contingent upon assessment of official transcripts of all higher education work attempted, letters of recommendation, and the Miller Analogies Test and Graduate Record Examination. All of these are required for admission to graduate study as a regular student without deficiencies in both the master's and doctoral programs.

Areas of Concentration. In addition to the study of the interaction between technology and culture, the department has three major technical areas of concentration. Students are expected to focus their course of study on one of these areas:

1. **Communication and Information Systems**—Study of visual, acoustical, telecommunication, and computer systems including the analysis of information transfer and its social/cultural impact.

2. **Transportation Systems**—The study of air, space, terrestrial, and marine systems, including components and social/cultural impacts.

3. **Production Systems**—The study of manufacturing, construction, and processing systems, including the social/cultural impact of the industrial revolution, automation, and cybernation.

Students may also include in their plans of study special problems, topics, or central themes related to technology, including appropriate technology, curriculum and instructional design in the technologies, energy, environment, international development, public policy, technology assessment, technology and culture, and technology transfer.

Master of Arts. There are two routes leading to the degree:

Thesis—Students planning to continue graduate study at the doctoral level are encouraged to choose this route. A minimum of 36 semester hours is required, including the development and successful defense of a thesis.

Project—Students interested in applying theory directly may choose this route. A minimum of 36 semester hours is required, including the development and presentation of a research project that illustrates the application of theory to the solution of a contemporary problem related to the study of technology.

Doctor of Education Area of Specialization

A personal plan of study leading to the Doctor of Education is designed by the student in conjunction with an adviser and faculty committee. The course of study is based on stated philosophy and objectives. Once the plan of study is approved, it becomes a contract between the student and the graduate faculty. Each personal program must include at least two continuous semesters of full-time, in-residence study. A minimum of 70 semester hours beyond the bachelor's degree and a research dissertation are required.

The curriculum is oriented toward the development of professional competencies rather than specific course requirements. Generally, the competencies include the ability to interpret and to initiate scholarly research in the discipline of technology, a knowledge of significant technical developments in at least one area of concentration, an understanding of the historical development, cultural impact, and future implications of technology, the ability to develop effective instructional programs in the technologies, and the ability to integrate information from various sources in solving socio-technical problems.

Competencies may be acquired through course work, independent study, supervised experience outside the University, or other arrangements approved by the student's adviser and faculty committee. Because the interdisciplinary nature of technology dictates a wide exposure to other disciplines, students are encouraged to take advantage of educational opportunities in other departments of the University community.

Master of Arts (M.A.)

I. Core Courses		Hours
Ed. P. 320—Introduction to Research		3
Ed. P. 330—Foundations of Educational Measurement	and	3
T.E. 384—Interdisciplinary Seminar		3
T.E. 340—Technology in History		3
T.E. 344—Technology and Society		3
T.E. 351—Contemporary Problems in Technology		3
T.E. 360—Technical Concepts: How Things Work		3
T.E. 497—Master's Degree Research		6
Total		27
II. Electives		9
Total		36

Electives are selected from University offerings and must contribute to student program objectives. Prior approval of the adviser for electives differing from the approved course of study is required.

Technology Education (T.E.)

- 245. *Women in International Development.** To examine the cultural diversities in the definition of women's roles and status, to investigate women's access to education, health, income, credit and technology, and to study women's contributions in third world development.
- 280. *Special Problems and Workshops.* I, II, S. 1-6 hr. To provide credits for special workshops and short intensive unit courses on special topics.
- 281. *Introduction to Technology.** 3 hr. An introduction to selected technical concepts and the evolution of the technical systems of transportation, communication, and production, with a focus on the relationship of these systems to technological change and the civilization process.
- 300. *Contemporary Problems in Transportation.** 3 hr. Technical and social/cultural problems related to efforts in the development and utilization of new and improved modes of transportation.
- 301. *Technical Developments in Transportation.** 3 hr. Selected developments in transportation technology. Principles, concepts, and processes fundamental to the design and development of transportation systems.
- 310. *Contemporary Problems in Communication.** 3 hr. Technical and social/cultural problems related to efforts in the development and utilization of new and improved modes of communication.
- 311. *Technical Developments in Communication.** 3 hr. Selected developments in communication technology; identification of principles, concepts, and processes fundamental to design and development of communication systems.
- 320. *Contemporary Problems in Production.** 3 hr. Technical and social/cultural problems resulting from efforts in the development and utilization of new and improved methods of producing goods and services.
- 321. *Technical Developments in Production.** 3 hr. Selected developments in production technology; identification of principles, concepts, and processes fundamental to the design and development of production systems.
- 330. *Contemporary Problems in Research and Development.* 3 hr. Research and investigation about transportation, communication, and production systems; technical and social/cultural problems related to research and development efforts.
- 340. *Technology in History.** 3 hr. A study of selected inventions and innovations that have altered the course of humankind, including a technical analysis of each and their contribution to the process of civilization.
- 344. *Technology and Society.** 3 hr. An analysis of the relationship of technical means, change, and society. Emphasis is on the influence of technical change on social institutions and culture in various societies.
- 351. *Contemporary Problems in Technology.** 3 hr. PR: T.E. 340 or 344 or consent. An analysis of current technical and social problems associated with the design, selection, and collective use of technical devices and systems.
- 355. *Technology and Environment.** 3 hr. PR: T.E. 340, 344, 351, or consent. A study of communication, production, and transportation systems, their impact on the environment and the analysis of resource management, machines and processes, energy use, health, and resource recovery related to these systems.

Courses marked with an asterisk () are offered on a planned sequence, i.e., fall, summer, spring. Other courses are offered as required by the student's plan of study.

356. *Energy and Society.** 3 hr. R: T.E. 340 or 344 or consent. An analysis of world energy resources and the problems associated with retrieval and conversion. Includes an analysis of the related social problems of citizen awareness, citizen responsibility, and public policy.

357. *Alternative Futures.** 3 hr. PR: T.E. 340 or 344 or consent. An overview of forecasting methods with group and individual activities using selected techniques to gain information about the future. Emphasis is on the design and redesign of technical systems for social purpose.

360. *Technical Concepts: How Things Work.** 3 hr. A study of the principles and components of technical devices. An analysis of mechanical, electrical, optical, acoustical, chemical, and pressure elements of technical systems.

371. *Curriculum Development and Physical Facility Design.** 3 hr. PR: T.E. 340 or 344 or consent. Development of curriculum components for the study of technology and the selection of facility design related to curricula requirements.

372. *Development of Instructional Materials.** 3 hr. PR: Consent. Design and development of media and instructional units for education in the technologies.

373. *Professional Development. I, II, S. 1-6 hr.* (May be repeated. Graded S or U. Not for degree credit.) PR: Consent. Specially designed experiences for those interested in advancing professional skills in the study of technology.

374. *Technology Education: Elementary School.** 3 hr. PR: T.E. 340, 344 or consent. An overview of technology, its role in society and its place in elementary curricula. Approaches to teaching technology as content and the integration of projects and activities into the elementary-school curriculum.

376. *Technology Education: Middle School.** 3 hr. PR: T.E. 340, 344, or consent. An overview of technology-related content appropriate for learners, age 10-14. Emphasis is on designing units and courses of study and the selection of instructional methods and materials.

378. *Technology Education: Secondary Schools.** 3 hr. PR: T.E. 340, 345, or consent. An overview of the content appropriate in technology courses for learners aged 14-18. Emphasis on designing units and courses of study and the selection of instructional methods and materials.

384. *Interdisciplinary Seminar—Technology and Culture.** 3 hr. PR: T.E. 340, 344, or consent. An analysis of the relationship between individuals, society, and technical systems. Guest presenters assist students in an examination of technology from the perspective of various disciplines.

385. *Practicum.** I, II, S. 1-12 hr. PR: Consent.

390. *Special Topics. I, II, S. 1-6 hr.* PR: Consent.

391. *Advanced Topics. I, II, S. 1-6 hr.*

397. *Master's Degree Research or Theory. I, II, S. 1-15 hr.*

400. *Technology: Its History and Development.** 3 hr. Major technical periods in the civilization process and the interrelationships of technological developments to the social/cultural milieu.

403. *Design in Technology. S. 3 hr.* Study of the design of technical products and systems.

404. *Readings in Technology and Culture.** 3 hr. Fundamental, historical, and contemporary ideas of the nature of technology as an area of created knowledge.

Courses marked with an asterisk () are offered on a planned sequence, i.e., fall, summer, spring. Other courses are offered as required by the student's plan of study.

405. *Innovation and Invention.** 3 hr. A study of the innovation and invention process.

480. *Projects in Technology.* I, II, S. 1-6 hr. PR: Consent.

481. *Problems in Technology.* I, II, S. 1-6 hr. PR: Consent.

490. *Teaching Practicum.* I, II, S. 2-4 hr. PR: Consent.

492. *Directed Study.* I, II, S. 1-6 hr. PR: Consent.

493. *Special Topics.* I, II, S. 1-6 hr. PR: Consent.

494. *Special Seminars.* I, II, S. 1-6 hr. PR: Consent.

495. *Independent Study.* I, II, S. 1-6 hr. PR: Consent.

496. *Graduate Seminar.* I, II, S. 1-4 hr. PR: Consent.

497. *Research.* I, II, S. 1-15 hr. PR: Consent.

498. *Thesis.* I, II, S. 1-4 hr. PR: Consent.

Courses marked with an asterisk () are offered on a planned sequence, i.e., fall, summer, spring. Other courses are offered as required by the student's plan of study.

THEATRE

W. James Brown, Chair

307-A Creative Arts Center

Degrees Offered: Master of Fine Arts

Graduate Faculty: Members Brown, Gagliano, Guillot, Herendeen, Neel, Olivieri, Siegrist, and Whitty. Associate Members Held, McQuiston, Milian, Romersberger, and Winsor

Master of Fine Arts

Admission. Prospective candidates for the degree of Master of Fine Arts in theatre (M.F.A.) must have a B.A. or B.F.A. degree or equivalent from an accredited institution. Ordinarily, a minimum of 30 semester hours in theatre at the undergraduate level is expected to have been completed with a grade-point average of no less than 2.5, although students with an undergraduate grade-point average of 2.25-2.5 may be admitted with probationary status.

Applicants must audition/interview. Applicants intending to specialize in acting must submit a complete resume of their acting experience, at least two letters of recommendation from acting coaches or directors, and must present an audition before at least one member of the acting faculty. Those intending to specialize in design must submit a complete portfolio of their work, a resume of their design experience, and at least two letters of recommendation from design instructors or directors. An interview with at least one member of the design faculty is also required.

For further details regarding these requirements, address inquiries to: Chairperson, Division of Theatre, College of Creative Arts, West Virginia University, P.O. Box 6111, Morgantown, WV 26506-6111.

Students may be eligible for 18 hours of graduate transfer credit for advanced standing if they meet the regular requirements of graduate admission. Students admitted with advanced standing are required to be in residence at WVU for a minimum of two semesters and a summer session. The request for advanced standing should be made to the division chairperson at the time of application.

Requirements. Successful completion of the minimum number of required graduate hours in one of the two following programs:

Studio Acting Option—(1) Two academic years and one summer of graduate course and production work totaling 54-55 credit hours; (2) A performance thesis project; (3) Oral defense of the thesis project; (4) A successful evaluation following the completion of the first year; and (5) Overall 3.0 grade-point average.

The studio option is a highly disciplined period of training that focuses on performance. Students will explore basic exercises leading to intensive scene work fully supplemented by technique courses in voice, speech, and movement. The actor takes courses in various areas that are essential to his/her craft (theatre history, text analysis, criticism, etc.) in order to strengthen his/her background. However, the greatest part of time is centered in the studio work every afternoon from 1:00 to 5:00 p.m. Each week, ten hours are spent on acting, four to six hours on voice and speech, and four to six hours on movement.

Design Option:

1. Three academic years of graduate course and production work totaling 69 credit hours;
2. A production thesis and research design project;
3. A successful evaluation following the completion of the first and second years; and
4. Overall 3.0 grade-point average.

Suggested Programs of Study

STUDIO ACTING OPTION

Semester I	Hours
Theat. 375—Acting.....	3
Theat. 351—Voice and Speech	2
Theat. 371—Movement	2
Theat. 491—Make-up	1
Theat. 331—Research	3
Theat. 200—Text Analysis	3
	<u>14</u>

Semester II

Theat. 376—Acting.....	3
Theat. 352—Voice and Speech	2
Theat. 372—Movement	2
Theat. 200—Text Analysis	3
Theat. 460—Theatre History.....	3
	<u>13</u>

Semester III (Summer)

Theat. 278—Repertory Theatre	6
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Semester IV

Theat. 353—Voice and Speech	2
Theat. 373—Movement	2
Theat. 377—Acting.....	3
Theat. 386—Criticism	3
Theat. 400—Performance Thesis or Theatre elective.....	3
	<u>13</u>

Semester V		
Theat. 374—Movement	2	
Theat. 354—Voice and Speech	2	
Theat. 378—Acting	3	
Theat. 400—Performance Thesis, or Theatre elective	3	<u>3</u>
	10	
TOTAL.....		56

M.F.A.—SCENE DESIGN OPTION

First Year

Fall

Theat. 220—Costume History & Design	3	
Theat. 395—Period Styles & Design	3	
Theat. 361—Sceno-graphics	3	
Theat. 331—Research Methods	3	<u>3</u>
	12	

Spring

Theat. 221—Costume History & Design	3	
Theat. 396—Period Styles & Design	3	
Theat. 205—Advanced Technical Theatre	3	
Theat. 379—Rehearsal & Performance	3	<u>3</u>
	12	

Second Year

Fall

Theat. 367—Scene Design	3	
Theat. 369—Lighting Design	3	
Theat. 386—Dramatic Criticism	3	
Theat. 379—Rehearsal & Performance	3	<u>3</u>
	12	

Spring

Theat. 367—Scene Design	3	
Theat. 369—Lighting Design	3	
Theat. 262—Scene Painting	3	
Theat. 379—Rehearsal & Performance or Elective	3	<u>3</u>
	12	

Third Year

Fall

Theat. 400—Thesis	3	
Theat. 379—Rehearsal & Performance	3	
Theat. 367—Scene Design	3	
Elective	3	<u>3</u>
	12	

Spring

Theat. 400—Thesis	3	
Theat. 367—Scene Design	3	
Elective	3	<u>3</u>
	12	

TOTAL.....		69
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The Costume and Lighting curricula follow tracks specific to each discipline.

Theatre (Theat.)

200. *Directed Theatre Studies.* I, II. 3-12 hr. (May be repeated for max. 12 hr. credit.) PR: Consent. Studies in theatre history, performance, stage design and technology, and theatre crafts. Subject matter and number of sections varies from semester to semester.

201. *Advanced Costume Construction.* I, II. 3 hr. (May be repeated for max. 12 hr. credit.) PR: Theat. 105. Study and practical application of costume construction through flat pattern, draping, and period projects. Production assignments on theatre productions.

205. *Advanced Technical Theatre.* I, II. 3 hr. (May be repeated for max. 6 hr. credit.) PR: Theat. 106, 107. Detailed study of scenery construction. Research projects, technical drawings, welding, properties construction, and study of new materials. Practical experience through work on productions.

206. *Stage Management.* I, II. 3 hr. PR: Theat. 106, 107, or consent. Detailed study of the role of the stage manager. Some stage management of Division of Theatre productions may be required.

210. *Theatre Dance 1.* I. 2 hr. PR: Dance 9. Develops a basic practical knowledge of choreographed movement in the musical theatre dance idiom. Includes a study of fundamentals of ballet for the actor, derivative musical/rhythmic forms, and elementary Broadway dance vocabulary and styles. (Also listed as Dance 210.)

211. *Theatre Dance 2.* II. 2 hr. PR: Theat. 210/Dance 210. Comprehensive study of representative musical theatre dance styles, relative to period (1900 to present) and ethnic derivation. Includes study of isolationary movement and principles of classical dance applicable to the Broadway idiom. (Also listed as Dance 211.)

212. *Theatre Dance Repertory.* I. 2 hr. PR: Dance 211/Theat. 211. Develops and expands the technical and stylistic fundamentals established in the Dance 210-211/Theat. 210-211 courses, applying them to reconstruction and staging of a variety of classic dance sequences from notable Broadway musicals. (Also listed as Dance 212.)

213. *Theatre Dance Performance Workshop.* II. 2 hr. PR: Dance 212/Theat. 212. Continues study of dance technique, isolationary movement and stylistic vocabularies established in previous theatre dance courses. Emphasizes development of original choreography in representative Broadway dance styles. Includes study of elements of performance in musical theatre. (Also listed as Dance 213.)

220. *Costume History 1.* I. 3 hr. Detailed study of modes and manners in dress from ancient Egypt through the Renaissance.

221. *Costume History 2.* II. 3 hr. Detailed study of modes and manners in dress from the late Renaissance to the present.

223. *Costume Crafts.* II. 3 hr. PR: Theat. 105, 201. Workshops conducted by faculty members, graduate students, visiting artists, and class members, using skills previously learned and providing "hands-on" experiences with a variety of materials and techniques.

225. *Theatrical Rigging and Electricity.* II. 3 hr. PR: Theat. 100, 107. A detailed study of the rigging systems used on the stage and of electricity as it relates to stage lighting.

240. *Musical Theatre Repertory.* I. (Alternate Years.) 2 hr. PR: Theatre/Dance 221, Music 41, or Consent. (Open to applied music majors in voice.) Integration of acting, music, and dance through their joint application to representative sequences from standard musical theatre literature.

241. *Musical Theatre Performance.* II. (Alternate Years.) 2 hr. PR: Theat. 240 or consent. (Open to applied music majors in voice.) Continuation of Theatre 240, focusing upon student staging and development in performance of contemporary and stylized works.

242. *Musical Theatre Literature.* I. (Alternate Years.) 3 hr. PR: Consent. (Open to applied music majors in voice.) Study of standard representative musical works focusing on style.

243. *Musical Theatre Practicum.* II. (Alternate Years.) 3 hr. PR: Theatre 242 or consent. (Open to applied music majors in voice.) Independent study in musical theatre.

251. *Advanced Vocal Techniques.* I. 2 hr. PR: Consent. Concentration on vocal character demands for the stage. Dialect work. Individual tutorials.

252. *Advanced Vocal Techniques.* II. 2 hr. PR: Consent. Continuation of Theat. 251.

260. *Theatre Performance and Rehearsal Laboratory.* I, II. 1-3 hr. (May be repeated for max. 9 hr. credit.) PR: Theatre major and consent. Participation in assigned theatre projects. Appreciation of creativity and performance techniques in theatre.

262. *Scene Painting.* I. 3 hr. PR: Theat. 168 or consent. A study in the basic techniques used in preparing and painting scenery. Practical experience in painting scenery for theatre productions.

267. *Advanced Problems in Theatre Design.* I, II. 3 hr. (May be repeated for max. 12 hr. credit.) PR: Theat. 167, 168. A detailed study of costume and set design through in-depth design projects.

268. *Advanced Costume Design.* I, II. 3 hr. PR: Th. 167, 168, 220, 221 or consent. (May be repeated for a maximum of 6 credit hours.) Advanced projects in costume design emphasizing text analysis, period research and sharpening of skills in figure drawing, characterization and painting toward the development of a portfolio. 1 hr. lec., 2 hr. lab.

269. *Advanced Theatre Lighting Design.* I, II. 3 hr. PR: Th. 107 or consent. (May be repeated for maximum 6 credit hours.) Advanced theories of lighting design for the stage. Projects emphasize text analysis for design conceptualization, light plot drafting and practical production experience. 3 hr. lec.

271. *Advanced Stage Movement.* I. 2 hr. PR: Theat. 172. Advanced study of movement techniques for character work. Period styles of movement.

272. *Advanced Stage Movement.* II. 2 hr. PR: Theat. 271. Continuation of the work in Theat. 271.

275. *Advanced Acting Studio.* I. 3 hr. PR: Consent. Continuation of advanced exercise work and styles. Coordinated with rehearsal/performance.

276. *Advanced Acting Studio.* II. 3 hr. PR: Consent. Continuation of the work in Theat. 275. Audition techniques.

278. *Repertory Theatre.* S. 1-6 hr. (May be repeated for max. 12 hr. credit.) PR: Consent. Rehearsal and performance techniques for producing plays in rotating repertory. Emphasis is on the creation of a synthesized company of performers, designers, and technicians.

280. *Advanced Play Directing.* II. 3 hr. PR: Theat. 180 or consent. Emphasis on the work of the director as an integrating artist. High level of proficiency in the direction of a one-act play is required of all students enrolled.

282. *Creative Dramatics.* I, II, S. 3 hr. PR: Theat. 75 or consent. Study and practice of creative dramatic activity as a method of learning and self development for children.

284. *Puppetry*. I, II. 3 hr. PR: Theat. 75 or consent. Comprehensive survey of construction and manipulation techniques of puppets. Evaluation of role of puppetry in child behavior and therapy techniques.

290. *Playwriting*. I, II. 3 hr. PR: Consent. Development of basic playwriting techniques. Specific assignments explore characterization, dramatic event, dialogue, tension, compression. Emphasis on the student finding his own voice, style, and courage to dramatize his view of the world.

291. *Advanced Playwriting*. II. 3 hr. PR: Theat. 290. Further exploration of dramatic technique, with emphasis on orchestrating the longer play. Also touches on script analysis of known dramatic texts and on practical problems of a playwriting career.

295. *Classic Theatre to 1700*. I. (Alternate Years.) 3 hr. A survey of theatre history, with emphasis on the development of performance conditions, from classical antiquity through the middle of the seventeenth century.

296. *European and American Theatre, 1700-1850*. II. (Alternate Years.) 3 hr. A survey of theatre history, with emphasis on the development of performance conditions, from the middle of the seventeenth century to the rise of Realism in the 1840s.

297. *Modern Theatre, 1850-1940*. I. (Alternate Years.) 3 hr. A survey of theatre history, with emphasis on the development of performance conditions, from the middle of the nineteenth century to the outbreak of World War II.

298. *Contemporary Theatre Since 1940*. II. (Alternate Years.) 3 hr. A survey of theatre history, with emphasis on the development of performance conditions, from World War II to the present.

307. *Light and Sound Seminar*. II. 3 hr. PR: Theat. 203 or equiv. An in-depth exploration of advanced lighting and sound for the theatre with particular emphasis on repertory lighting, dance, and opera.

331. *Research Methods and Survey*. I. 3 hr. PR: Consent. Research methods and techniques for theatre artists, scholars, and designers.

333. *Seminar in Production Research*. II. 3 hr. PR: Theat. 331, 367. Seminar approach to individual design projects with oral and written presentation of research materials. Intensive critique within class by faculty and peers.

334. *Theatre Design—Portfolio Preparation*. I. 3 hr. PR: Theat. 307, 333. An in-depth work in packaging and presentation of portfolio work, job opportunities, and preparation for professional union examinations.

351. *Graduate Vocal Techniques*. I. 2 hr. PR: Consent. Reinforcement of basic vocal techniques with special focus on the actor's individual qualities.

352. *Graduate Vocal Techniques*. II. 2 hr. PR: Consent. Continuation of Theat. 351.

353. *Advanced Graduate Vocal Techniques*. I. 2 hr. Concentration on vocal character demands for the stage. Dialect work. Individual tutorials.

354. *Advanced Graduate Vocal Techniques*. II. 2 hr. PR: Consent. Continuation of Theat. 353.

362. *Styles of Production Design*. I. 3 hr. PR: Theat. 295, 296, or consent. Extensive and intensive study of production styles in costume, lighting, and scene design.

367. *Theatre Design*. I. 3 hr. (May be repeated for max. 9 hr. credit.) PR: Theat. 267 or equiv. A lecture/studio course in scenery and costumes. Intensive practical experience in drawing, painting, and model building for portfolio presentation.

371. *Graduate Stage Movement*. I. 2 hr. PR: Consent. Study of movement techniques focusing on use of dynamics on the stage. Development of spatial awareness.

372. *Graduate Stage Movement*. II. 2 hr. PR: Consent. Continuation of the work in Theat. 371.

373. *Advanced Graduate Stage Movement*. I. 2 hr. PR: Consent. Advanced study of movement techniques for character work. Period styles of movement.

374. *Advanced Graduate Stage Movement*. II. 2 hr. PR: Consent. Continuation of the work in Theat. 373. Tutorials.

375. *Graduate Acting Studio*. I. 3 hr. PR: Consent. Advanced exercise work, role analysis and process. Scene study concentration on problem solving in beginning style work. Coordinated with rehearsal/performance.

376. *Graduate Acting Studio*. II. 3 hr. PR: Consent. Continuation of Theat. 375. Coordinated with rehearsal/performance.

377. *Advanced Graduate Acting Studio*. I. 3 hr. PR: Consent. Continuation of advanced exercise work and styles work. Coordinated with rehearsal/performance.

378. *Advanced Graduate Acting Studio*. II. 3 hr. PR: Consent. Continuation of Theat. 377. Audition techniques.

379. *Rehearsal and Performance*. I. 3 hr. (May be repeated for max. 12 hr. credit.) PR: Consent. Participation in assigned performance projects.

395. *Period Style 1*. I. 3 hr. PR: Theat. 167 or equiv. An in-depth exploration of architecture, costumes, customs, and ornamentation in period style for the theatre from Egyptian through Renaissance.

396. *Period Style 2*. 3 hr. PR: Theat. 395 or equiv. An in-depth exploration of architecture, costumes, customs, and ornamentation in period style for the theatre from the Baroque to the present.

400. *Performance Thesis*. I, II. 3 hr. PR: Consent. Creative performance project. Requires the production of a written record which traces the acting or design process as it develops during planning, rehearsal, and performance.

460. *Specialized Seminars*. 3-9 hr. (May be repeated for max. 9 hr. credit.) PR: Consent. Selected fields of study in theatre.

491. *Advanced Study*. I, II, S. 1-6 hr. PR: Consent. Investigation in advanced subjects which are not covered in regularly scheduled courses. Study may be independent or through specially scheduled lectures.

497. *Research*. I, II. 1-15 hr.

499. *Graduate Colloquium*. I, II, S. 1-6 hr. PR: Consent. For graduate students not seeking course work credit but who wish to meet residence requirements, use University facilities, and participate in its academic and cultural programs.

WILDLIFE and FISHERIES MANAGEMENT

Jack E. Coster, Chairperson of Division of Forestry

322-A Percival Hall

Harry V. Wiant, Jr., Coordinator of the Graduate Program

Degree Offered: Master of Science

Graduate Faculty: Members Brown, Margraf, Michael, Perry, Samuel, Smith, and Whitmore.

Master of Science (M.S.)

The Division of Forestry of the College of Agriculture and Forestry offers programs leading to the master of science for students who wish to major in management. Admission requirements are those of the College of Agriculture and Forestry. Degree requirements are either 30 semester hours of approved

study, including a six credit-hour thesis, or 33 hours without a thesis but with a three credit-hour problem paper. Those programs ordinarily require two years of residence.

Wildlife Management (W. Man.)

213. *Wildlife Ecosystem Ecology*. I. 3 hr. PR: Biol. 1, 2, and 51 or consent. Basic principles of ecosystem ecology, emphasizing structure and function, succession, adaptation of organisms to the environment (physiological ecology), and survey of major ecosystems with emphasis on their role as wildlife habitats.

214. *Wildlife Population Ecology*. II. 3 hr. PR: W. Man. 213 or consent. Emphasis on theoretical and applied population ecology including population growth, interactions, regulation, and effects of harvesting and exploitation on natural populations. 2 hr. lec., 1 hr. lab.

224. *Vertebrate Natural History*. I. 3 hr. PR: Biol. 2 or consent. Relationships of fish, amphibians, and reptiles to the forest, with emphasis on the ecology, taxonomy, evolution, natural history, and field identification of these groups. Laboratory emphasizes natural history and anatomy of fish, amphibians, and reptiles.

225. *Mammalogy*. 3 hr. PR: Biol. 2 and 4 or consent. Mammals and their biological properties with emphasis on life history, ecology, and distribution of regional forms. (Also listed as Biol. 258.)

226. *Ornithology*. II. 3 hr. PR: Biol. 1, 2, or consent. Identification, distribution, and ecology of birds (particularly of forest lands). (2 hr. lec., 1 hr. lab.)

228. *Wildlife Policy and Administration*. II. 3 hr. Study of the organization, authority, policies, programs, and administration of public agencies and private organizations concerned with fish and wildlife. Emphasis is on the legal and political role in making wildlife management decisions.

231. *Wildlife Techniques*. I. 3 hr. PR: Wildlife major or consent; W. Man. 213, Biol. 151. Field and laboratory techniques necessary in management and study of wildlife; collection of field data, mapping, censusing, habitat evaluation, literature and scientific writing.

234. *Principles of Wildlife Management*. II. 3 hr. PR: Wildlife major or consent; W. Man. 213, 231. Major game animals and problems and principles involved in their management.

312. *Advanced Wildlife Population Ecology*. II. 3 hr. PR: W. Man. 214 or equiv., or consent. Case history approach to wildlife population ecology with emphasis on ungulates, gallinaceous birds, large predators; forest invertebrates and their vertebrate predators; endangered species; genetics and conservation of wildlife populations. Emphasis on current and historical literature. (3 hr. lec.)

333. *Quantitative Ecology*. I. 3 hr. PR: Stat. 311 or equiv., and W. Man. 213 or equiv. A survey of techniques and strategies for the quantitative analysis of complex ecological data sets. (Offered in Fall of odd years.)

370. *Wildlife Seminar*. II. 1 hr. per sem.; (4 hr. max.). PR: Consent. Discussion of current developments in wildlife management.

380. *Rural and Urban Wildlife Management*. II. 3 hr. PR: Consent. Management of nongame wildlife in the rural and urban environment, emphasizing habitat improvement and development and control of pest species. 2 hr. lec., 1 hr. lab. (Offered in Spring of odd years.)

434. *Ecology and Management of Upland Wildlife*. I. 4 hr. PR: Consent. Ecology and management of upland game birds and mammals with emphasis on recent literature. (Offered in Fall of even years.)

436. *Ecology and Management of Wetland Wildlife*. II. 4 hr. PR: Consent. Ecology and management of waterfowl and wetland furbearers with emphasis on recent research and management literature. (Offered in Spring of even years.)

Part 5

OTHER GRADUATE COURSES AND FACILITIES

Agricultural Mechanics

Agricultural Mechanics (Ag. M.)

230. *Farm Structures*. II. 3 hr. Study of structures required for agriculture, family housing, storage, and recreation. Includes function, planning, layout, materials, construction techniques, prefabrication, repair, remodeling, and costs. 2 hr. rec., 3 hr. lab.

240. *Agricultural Engines*. I, II. 3 hr. Study of power sources (gasoline, diesel, turbine, wankel, etc.) for agriculture and forestry. Operation, selection, maintenance techniques, and emissions impact on power and fuel efficiency. 2 hr. rec., 3 hr. lab.

260. *Advanced Farm Machinery*. I. 3 hr. Systems approach to selection, use, and operation of machinery as related to agriculture, forestry, and other rural activities. Emphasis on safety and environmental impact. Use of records for management decisions, purchase, replacement, sale, or overhaul. 2 hr. rec., 3 hr. lab.

270. *Electricity in Agriculture*. II. 3 hr. Study of production and safe use of electricity for home and agriculture. Emphasis on approved wiring practices, motors, and electrical controls and their applications in lighting, heating, refrigeration, air conditioning, water supply, and processing. 2 hr. rec., 3 hr. lab.

321. *Advanced Farm Mechanics*. S. 3 hr. PR: Ag. M. 120. Development of advanced skills with hand and power tools. Areas of emphasis dependent upon needs of individual students. Care and maintenance of power tools and shop organization and planning are essential parts of this course. 1 hr. rec., 6 hr. lab. (Offered summer of every third year—next offering 1990.)

Education Foundations

Anne Nardi, Division Director

608 Allen Hall

Graduate Faculty: Member Bilow and Shea.

Education Foundations (Ed.F.)

300. *Sociology of Education*. I or II. 3 hr. Education as a social institution; cultural and class influences on education; social roles and career patterns in the school system; the school and problems of the community. (Also listed as Soc. & A. 232.)

320. *Philosophic Systems and Education*. I, II, S. 3 hr. Examines different systems of educational philosophies focusing on aims, values, and criteria of education. Stresses the application of philosophic thinking to educational language, issues, methods, and subject matter.

340. *History of American Education*. II, S. 3 hr. Major forces affecting U.S. educational developments at all school levels are examined in political, social, economic, and cultural context. Major historical periods include colonial, early national, pre/post civil war, and late nineteenth to mid-twentieth century.

350. *Comparative Education*. II. 3 hr. PR: Graduate standing. Compares educational systems in selected foreign countries with the United States. Examines formal and informal educational influences in historical and contemporary contexts and in socioeconomic, political, and philosophical perspectives.

- 380. *Special Problems.* II. 1-6 hr. PR: Consent.
- 383. *Seminar.* I, II, S. 1-6 hr. Selected topics in historical, sociological, and philosophical foundations of education. (Titles to be announced each semester.)
- 385. *Practicum.* I, II. 1-12 hr. PR: Consent.
- 390. *Special Topics.* I. 1-6 hr. PR: Consent.
- 391. *Advanced Topics.* I, II, S. 1-6 hr.
- 491. *Advanced Study.* I. 1-6 hr. PR: Consent.
- 497. *Research.* I, II. 1-15 hr. PR: Consent.

Gerontology Center

The WVU Gerontology Center reflects the University's commitment to increase understanding of the aging process, and support efforts to improve the quality of life for elderly persons, particularly the rural elderly of Appalachia. The Gerontology Center promotes and coordinates interdisciplinary teaching, research, and service in aging at WVU.

A graduate certificate program in multidisciplinary gerontology is available through the Center for graduate students pursuing advanced degrees in other fields and special graduate students who are non-degree candidates.

The certificate program requires a minimum of 15 graduate hours including fundamentals of gerontology, which is cross-listed as Biology 375 and Psychology 375, and nine elective hours selected on the basis of appropriateness to the individual student's goals from an approved pool of aging-related courses offered in a number of departments throughout the University. Finally, all students will enroll for three hours in research or special topics. A research project and paper which demonstrates linkage between gerontology and the student's primary discipline is required. This capstone paper will be presented at a gerontology research seminar conducted by the Gerontology Center.

University units involved in teaching and research in human aging include the College of Arts and Sciences, the College of Human Resources and Education, the College of Agriculture and Forestry, the School of Physical Education, the School of Social Work, the School of Medicine, the School of Nursing, the School of Pharmacy, and the Center for Extension and Continuing Education.

The Center's library collection augments the gerontology holdings of other campus libraries, and is open to the entire community, Monday through Friday, 8:30 a.m.-5:00 p.m.

Candidates for the graduate certificate must meet regular general WVU graduate admission requirements and must be able to demonstrate elementary knowledge of gerontology, i.e. material covered in MDS 50—Introduction to Gerontology. Program participants must maintain a minimum grade-point average of 3.0 in Certificate course work.

The Gerontology Center also offers an undergraduate certificate program which is available by consent to returning students already holding bachelor's degrees who elect to study gerontology at a less advanced level. A practitioner certificate based on continuing education credits is offered to persons employed in the aging field who wish to increase their knowledge of applied gerontology as they work.

Further information, assistance in academic program planning in multi-disciplinary gerontology, and registration forms may be obtained from the West Virginia University Gerontology Center, Chestnut Ridge Professional Building, Morgantown, WV 26506. (Telephone 304/293-2081).

Gerontology (Geron.)

291/391. *Special Topics.* I, II. 1-3 hr. PR: Consent. Special problems for undergraduate and graduate students working on certificate programs. Topics change from semester to semester. Students can enroll more than once.

Other graduate courses on aging can be found in departments throughout the University. Required courses for the Graduate Certificate in Gerontology is: Psych. 375—Fundamentals of Gerontology (see Psychology section), or Bio. 375—Fundamentals of Gerontology (see Biology section).

For a complete listing of aging-related courses including Graduate Certificate electives, contact the Gerontology Center, Chestnut Ridge Professional Building, 912 Chestnut Ridge Road, Morgantown, WV 26506. Telephone: (304) 293-2081.

Landscape Architecture

Landscape Architecture (L. Arc.)

229. *Landscape Architecture.* I. 3 hr. (For non-Landscape Architecture majors only.) An appreciation of basic principles of design and information pertaining to use and care of ornamental plants around the house.

248. *Design Analysis.* II. 2 hr. PR: Consent. Analysis of planning and design projects with respect to offering solutions to a given problem. (Offered in Spring of odd years.)

265. *Regional Design.* II. 3 hr. PR: Consent. Consideration of regional landscapes in order to effectively relate design to the ecology and development of a region. (Offered in Spring of even years.)

284. *Professional Practice.* I. 3 hr. PR: Consent. Procedures in preparation of contract documents, fees, estimates, operation of an office, and relationship to clients and contractors.

Library Science

Library Science courses can be a part of many graduate programs as electives in some and as a field of study in others.

The courses are designed for the following students:

1. Elementary or secondary school teachers who wish to meet the certification requirements for school library media specialists in West Virginia and other states.

2. Certified teachers and school librarians desiring further development in the field of library science.

3. Administrators who wish to broaden their knowledge and training in the field of school library media.

4. Graduate students in other fields in humanities and social sciences desiring electives in library science.

In addition, the department offers courses designed to give students a working knowledge of the major information sources in specific areas and to help them in using the library effectively.

Students pursuing a master of arts degree in education with an option in library science must take 12 hours in education, 12 hours in library science, and 12 additional hours in library science, education, or a related field for a total of 36 hours. Consult the Department of Library Science for specific course requirements. Comprehensive examinations are required in both education and library science.

Library Science (L. Sci.)

201.* *Reference and Bibliography.* Every third semester. 3 hr. Basic reference materials in print and non-print formats (dictionaries, encyclopedias, indexes, yearbooks, computerized data bases, etc.) are studied and evaluated. Emphasizes theory of information seeking and practical experience with materials.

203.* *Literature for Children. I, II.* 3 hr. A survey of children's literature including its historical development as well as current trends. Emphasizes selection, critical evaluation, and utilization of literary materials for developmental, recreational, and curriculum needs. Appropriate media included.

205.* *Young Adult Literature.* Every third semester. 3 hr. Survey of adolescent literature and other library materials (print and non-print) for junior and senior high school students.

222.* *Field Practice. I, II.* 3 hr. PR: L. Sci. 201, 203, 205, 223, 250. Practical experience in a variety of public, school, and special libraries, and instructional materials centers, under the supervision of experienced librarians and media specialists. Students must complete 100 clock hours.

223.* *Cataloging and Classification.* Every third semester. 3 hr. Basic principles and problems of cataloging and classification combined with practical experience in processing the various types of books and materials. Problems peculiar to the teacher-librarian considered.

250.* *Managing School Library Media Centers.* Every third semester. 3 hr. PR: L. Sci. 201, 203, 205, 223; Ed. P. 260, or consent. Covers planning, organizing, and operating a school library media center. Includes staffing, budgeting, scheduling, public relations, and program design. Stresses the role of the media center in the total educational process.

291. *Advanced Study.* Every third semester. 1-3 hr. (May be repeated for credit only when the content of the course is different.) Study of current topics related to informational resources or the school media center. A final project will be required.

326. *Bibliography of the Social Sciences. II.* 1-2 hr. Covers bibliographic structure and information sources in psychology, sociology, political science, economics, history, education, and related disciplines. Provides a good working knowledge of information retrieval tools and the ability to use libraries effectively.

391. *Advanced Study—Data Base Searching. I, II.* 1 hr. Course is designed to enable students to conduct effective searches of computerized data bases. Both basic principles and hands on experience are included.

410. *Special Topics. I, II, S.* 3 hr. A thorough study of some phase of library science based on the needs and interest of the individual.

*Presently required for School Library Media Certification in West Virginia.

Multidisciplinary Studies

Multidisciplinary Studies (MDS) courses are those which: (a) analyze significant issues, problems, or themes by applying two or more disciplines to them; or (b) explore the theoretical and methodological relationship of two or

more disciplines to each other; and (c) involve a combination of disciplines so as to preclude their being classified realistically as one of humanities, social science, or physical science.

Responsibility for approving MDS courses rests with the LSP Committee and the Faculty Senate. Each course has its own staff, drawn from the faculties of the schools and colleges of the University.

Multidisciplinary Studies (MDS)

250. *Issues in Gerontology.* II. 3 hr. PR: Consent. Analysis of societal aspects of aging and exploration of current issues in gerontology. Relating of gerontological concepts to previous course work and field experience.

Pathology

Research Areas—Atherosclerosis; thrombosis; platelet aggregation and functions with correlative ultrastructural study, lipid and lipoprotein metabolism in cultured human endothelial cells; morphometric (including electron microscopic) and biochemical studies on the progression of atherosclerotic lesions in humans; regression of experimental atherosclerotic lesions; ultrastructural aspects of renal disease; ultrastructural reflections of dedifferentiation in neoplasia; histogenesis of neoplasia; biomedical application of laboratory medicine; applied laboratory studies in microbiology.

Pathology (Path.)

328. *Basic Pathology.* (For dental students and graduate students, with consent.) II. 5 hr. PR: Anat. 309. General changes in basic pathologic processes and changes evoked in specific organ systems as a basis for understanding clinical disease.

338. *Oral Pathology 1.* II, S. 3 hr. PR: Path. 328, or consent. Clinical, radiographic, and microscopic discussion of local and systemic diseases affecting oral and paraoral structures.

350. *Hematology.* 3 hr. (For certain graduate students, with consent of chairperson.) Includes morphologic description of formed elements of blood including classification of red blood cell, white blood cell, and platelet disorders. Case material and slide reviews are integral parts of the course work.

351. *Pathology and Laboratory Medicine 1.* (For medical students and limited number of regular full-time graduate students in medical basic sciences and consent of the chairperson.) I. 8 hr. PR: Medicine I Curriculum. Presents pathology as a body of knowledge and a discipline, including laboratory aspects of disease. General pathology, including cell injury, inflammation, neoplasia, thrombosis and circulatory disturbances, is followed by a systemic approach to disease states.

352. *Pathology and Laboratory Medicine 2.* (For medical students and limited number of regular full-time graduate students in medical basic sciences and consent of the chairperson.) II. 7 hr. PR: Path. 351. Continuation of Path. 351.

353. *Oral Pathology 2.* I. 2 hr. PR: Path. 338; consent. Continuation of Path. 338.

355. *Oral Disease Diagnosis and Management.* (For dental students, third year.) II. 1 hr. PR: Path. 338, 353; consent. Oral and systemic diseases are presented clinically, radiographically, and histologically. Diagnosis is established and treatment arrived at through group discussion.

356. *Advanced Pathology.* I, II. 3 hr. PR: Path. 328 or 351; consent. Microscopic and gross specimens from selected autopsies.

- 382. Advanced Oral Histopathology. I, II. 1-2 hr. PR: Path. 338, 353; consent. Microscopic study of head and neck lesions.
- 401. Special Studies in Oral Pathology. I, II. 1-3 hr. PR: Consent. Advanced seminar or independent study of local and/or systemic disease processes affecting oral and facial structures.
- 491. Advanced Study. 1-3 hr. PR: Consent. Specialized study in subspecialty, such as blood banking, clinical chemistry, immunopathology. (Special lectures and/or seminar.)
- 497. Research. I, II. 1-15 hr. PR: Consent.

Philosophy

Philosophy (Phil.)

- 253. Philosophy of Mathematics. I or II. 3 hr. PR: Phil. 106 or consent. Contemporary viewpoints in the foundations of mathematics. (Not offered every year.)
- 283. Philosophy of History. I or II. 3 hr. PR: 6 hr. in philosophy or history major or consent. Theoretical problems such as the nature of historical explanation, relativism, and the status of speculative principles of history. (Not offered every year.)
- 285. Philosophy of Language. I or II. 3 hr. PR: 6 hr. in philosophy or linguistic or language major or consent. Philosophical problems concerning the nature of meaning and language. (Not offered every year.)
- 290. Directed Studies. I, II, S. 1-6 hr. (May be repeated for credit.) PR: Instructor's written consent. Individually supervised research and projects.
- 292. Advanced Topics in Philosophy. I or II. 3 hr. PR: 6 hr. in philosophy or consent. Advanced philosophical investigation of selected problems and issues. Topics will vary.
- 294. Medical Ethics. I or II. 3 hr. PR: Junior standing or consent. Ethical issues in health care practice, research, and policy. Topics include the professional-patient (client) relationship, forgoing life-sustaining treatment, euthanasia, abortion, reproductive technology, and the distribution of scarce and/or costly medical resources.
- 302. Philosophy of Science. I or II. 3 hr. Philosophical problems associated with the concepts and methodology of science.
- 303. Theory of Knowledge. I or II. 3 hr. Definitions of knowledge, truth, and belief. Problems associated with skepticism of induction, perception, introspection, memory, and *a priori* knowledge.
- 305. History of Philosophy. I or II. 3-9 hr. Selected topics in the history of Western philosophy, usually with concentration on one of the following periods: ancient, medieval, modern, or recent.
- 306. Metaphysics. I or II. 3 hr. Traditional problems associated with universals and particulars, reality and experience, causality, space and time, matter and mind, the nature of the self, etc. (Not offered every year.)
- 308. Ethics of the Marketplace. I, II. 3 hr. An examination of moral questions regarding the evaluation of economic systems, labor/management relationships, product liability, advertising, codes of conduct, and conflicts of interest. (Not offered every year.)
- 310. Ethics. I or II. 3 hr. An examination of selected theoretical and applied problems in the field of professional ethics.
- 313. Advanced Philosophy of the Social Sciences. I or II. 3 hr. PR: Consent. Philosophical problems associated with the concepts and methodology of the social sciences.
- 321. Seminar: Selected Topics. 3-9 hr.

- 391. Advanced Topics. I, II, S. 1-9 hr.
- 397. Master's Degree Research or Theory. I, II, S. 1-9 hr. PR: Consent.

Physical Science

Physical Science (P. Sci.)

- 490. Teaching Practicum in Physical Science. I, II. 1-3 hr. PR: Consent. Opportunity to develop instructional materials for and help teach innovative physical science courses under the supervision of a faculty member.
- 491. Advanced Study. I, II. 1-3 hr. PR: Consent.

Religious Studies

Religious Studies (Relig.)

- 290. Seminar: Selected Topic. I or II. 3 hr. PR: A previous religious studies course or consent.
- 491. Advanced Study in Religious Studies. I, II, S. 3 hr. PR: Consent. Investigation of advanced topics related to undergraduate courses in religious studies. (Independently arranged.)

Wildlife Management

Wildlife Management (W. Man.)

- 312. Advanced Wildlife Population Ecology. 3 hr. PR: W. Man. 131, Stat. 211, or equiv. Theory of population growth, population change, intraspecific, interspecific relationships involved in natural regulation of population, and effects of exploitation management on wildlife populations. (Offered spring of even years.)
- 333. Quantitative Ecology. (Alternate Years.) 3 hr. PR: Stat. 311 or equiv. and W. Man. 213 or equiv. Survey of techniques and strategies for quantitative analyses of complex ecological data sets.
- 370. Wildlife Seminar. 1 hr. per sem.; 4 hr. max. PR: Consent. Discussion of current developments in wildlife management.
- 380. Rural and Urban Wildlife Management. 3 hr. PR: Consent. Management of nongame wildlife in the rural and urban environment, emphasizing habitat improvements and developments and control of pest species. (Offered spring of odd years.)
- 434. Ecology and Management of Upland Wildlife. 4 hr. PR: Consent. Ecology and management of upland game birds and mammals; emphasis on recent literature. (Offered fall of even years.)
- 436. Ecology and Management of Wetland Wildlife. 4 hr. PR: Consent. Ecology and of waterfowl and wetland furbearers with emphasis on recent research and literature. (Offered spring of even years.)

Center for Women's Studies

Judith G. Stitzel, Ph.D. (U. Minn.), Director of Center for Women's Studies; Professor of English.

The Center for Women's Studies grows out of West Virginia University's commitment to addressing the complex and varied needs of the women and men of the future. New career opportunities, new flexibility in male and female roles, new economic realities and new scholarship on women are challenging us all to rethink old assumptions and explore new possibilities for our lives. Established in 1984 within the office of the Vice President and Provost for Academic Affairs and Research, the center is a response to this intellectual challenge. The center acts to facilitate and stimulate teaching and

research throughout the University and the community on women and gender-related issues and to coordinate the interdisciplinary Women's Studies Program.

The basic premise of the women's studies program is that knowledge of women's experiences and achievements is fundamental to our knowledge of humankind and that the new scholarship on women offers important perspectives on the methods and content of the traditional disciplines.

Academic Opportunities in Women's Studies

The Master of Arts in Liberal Studies (M.A.L.S.) is an interdisciplinary degree which provides the opportunity for highly motivated students to continue their studies in the Liberal Arts beyond the baccalaureate, under a coherent, structured program, but without an exclusive concentration in one discipline. Each student, in conjunction with a graduate adviser, will put together his or her own curriculum, centered around some topic or interdisciplinary area of special interest to the student. This interdisciplinary degree has been successfully used by students interested in graduate level work in Women's Studies. For further information on M.A.L.S., contact Marilyn Bendenna, Department of Foreign Languages, Chitwood Hall, (304) 293-5121.

Although no graduate certificate in women's studies is presently available, students may choose to add an Undergraduate Certificate in Women's Studies to their bachelor's degree. The certificate recognizes a specific concentration of women's studies courses and would constitute a valuable professional credential for graduates in a variety of careers necessitating an understanding of women's issues. Details about the certificate are available from the center.

In addition, students may choose to be examined on women's studies as a field of concentration in a number of graduate programs as well as to do research on women and/or gender-related issues. The Center for Women's Studies also sponsors workshops, seminars, and special lectures to bring women's studies scholarship and concerns before the university and community. To receive a detailed schedule of courses and further information about the activities, contact the Center for Women's Studies, 200 Clark Hall, 293-2339.

In addition to the women's studies courses listed below, other courses focusing on women and gender and independent study opportunities are available in several university departments.

Women's Studies (Wm. St.)

240. *Methods and Perspectives in Women's Studies.* I, II. 4 hr. PR: Junior standing or consent. Exploration of theories, perspectives, and methods appropriate to the interdisciplinary study of women and gender.
290. *Independent Study.* I, II, S. 1-6 hr. Individual study of an interdisciplinary issue in women's studies and/or gender studies.
391. *Advanced Topics.* I, II. 1-6 hr. PR: Consent. Investigation in advanced women's studies topics not covered in regularly scheduled courses. Study may be independent or through specially scheduled meetings.
491. *Advanced Study.* I, II. 1-6 hr. PR: Consent. Investigation in advanced women's studies topics not covered in regularly scheduled courses. Study may be independent or through specially scheduled meetings.

Wood Sciences

Wood Sciences (Wd. Sc.)

320. *Wood Microstructures.* 3 hr. PR: Wd. Sc. 123; senior standing, or consent. Detailed examination of wood microstructure as it relates to processing behavior and identification.

340. *Advanced Physical Behavior of Wood.* 3 hr. PR: Wd. Sc. 240 or equiv. or consent. Physical relationships of water and wood. Fluid flow through wood; thermal, electrical, and acoustical behavior of wood. Theories of wood drying and their application.

362. *Forest Products Operations Research Models.* 3 hr. PR: Wd. Sc. 262 and demonstrated knowledge of Fortran and Basic, or consent. Analysis of operations research models currently used by the forest products industry. Students will develop new models. (Offered spring of even years.)

473. *Seminar in Wood Utilization.* 1 hr. per sem.; max. credit, 4 hr. PR: Consent. Reports and discussion of recent research in fundamental and applied phases of wood utilization.

Energy and Water Research Center

Energy Research Division

The Energy Research Division (ERD) stimulates and coordinates energy research conducted by University faculty and graduate students. Independent of any single academic unit, the division administers some of the University's energy research programs and maintains an information data base on all energy activities.

The primary thrust of the research sponsored through the ERD is the development of safer, more economical and environmentally sound ways to mine, transport, and combust coal or convert it to liquid fuels and chemicals, along with improved marketing methods. The ERD also supports research in petroleum and natural gas extraction and use as well as in alternative energy resource development. The division favors an interdisciplinary approach for the programs it sponsors.

The ERD indirectly supports a number of graduate research assistantships. Since projects are managed by the faculty members who receive ERD awards, students interested in becoming part of an ERD program should contact the department chairperson to learn about the availability of assistantships in their department.

For more information about the ERD, contact Professor Richard A. Bajura, Director, or Caulton L. Irwin, Associate Director, WVU Energy Research Division, 258 Stewart Street, Morgantown, WV 26506.

Mining and Mineral Resources Research Institute

West Virginia University has been designated by the federal government as one of 32 institutes dedicated to research and advanced training of students in the mining and mineral resources area. The WVU program focuses on researching problems associated with mining in West Virginia and the Appalachian region. Managed by the Energy Research Division, this program provides opportunities for WVU faculty to receive support for research projects involving students.

Generic Technology Center for Respirable Dust (GTCRD)

West Virginia University, through the Energy and Water Research Center, is a member of the Generic Technology Center for Respirable Dust

(GTCRD), a program funded by the U.S. Bureau of Mines. Begun in 1983, one of the focuses of the GTCRD is in the area of coal workers' pneumoconiosis, or black lung disease. Several of the University's projects deal with developing methods to prevent coal workers' pneumoconiosis and involve researchers from the College of Mineral and Energy Resources, College of Engineering, School of Medicine, and College of Arts and Sciences.

The GTCRD supports graduate students as well as post-doctoral fellows. To learn whether assistantships are available in a department through this program, students should contact their department chairpersons.

Consortium for Fossil Fuel Liquefaction Science (CFFLS)

Through the Energy and Water Research Center, WVU is one of six research organizations that form the Consortium for Fossil Fuel Liquefaction Science (CFFLS), a group dedicated to the continued development of coal liquefaction as an energy resource alternative. WVU faculty members and graduate students are participating in this program. Research awards are made through the Energy and Water Research Center to the faculty members who then manage the projects at the department level.

Students who are interested in assistantships in the area of liquefaction should contact their department chairpersons to learn whether CFFLS research assistantships are available.

Oak Ridge Associated Universities (ORAU)

West Virginia University is a member of Oak Ridge Associated Universities (ORAU), a nonprofit, education and research management corporation of 49 colleges and universities. ORAU, established in 1946, conducts programs in research, education, information, and human resource development for a variety of government and private organizations. It is particularly interested in three areas: energy, health, and environment.

Among ORAU's activities are competitive programs to bring undergraduate and graduate students and faculty members to work on research problems at the research facilities of the Department of Energy (DOE) and other federal agencies. Participants are selected by ORAU and the staffs of the facilities participating in the ORAU programs, which are: Oak Ridge National Laboratory; the Oak Ridge Y-12 Plant; the Oak Ridge Gaseous Diffusion Plant; the Atmospheric Turbulence and Diffusion Division in Oak Ridge; the Savannah River Laboratory and Savannah River Ecology Laboratory in Aiken, S.C.; the Pittsburgh Research Center of the U.S. Bureau of Mines; the National Center for Toxicological Research in Jefferson, AR; the Puerto Rico Nuclear Research Center; and the U.S. DOE Energy Research Technology Centers in Pittsburgh, PA, and Morgantown. The ORAU Institute for Energy Analysis, the Professional Training Program, the Medical and Health Sciences Division, and its other programs are also open to qualified students and faculty members.

Professional Internship Program. Program appointment periods that alternate with terms of full-time academic study at the student's home institutions afford students opportunities to apply the theories and methods learned in the classroom in a research environment under the guidance of a research adviser.

Graduate Internship Program. Internships at federal laboratories related to the student's major and career goals provide opportunities to apply theories and methods learned in the classroom and introduce the student to research areas for consideration as possible thesis or dissertation topics.

Post-Graduate Research Program. Research appointments are available for recent masters and doctoral degree recipients. Up to two years of support for collaborative research at federal laboratories is provided.

Faculty. Faculty members of WVU, under the ORAU Faculty Research Participation Program, can go to a Department of Energy facility for varying periods up to three months, for advanced study and research. It is also possible to combine a sabbatical with a longer appointment. Part-time appointments during the academic year are also available at certain laboratories.

Stipends. Student stipends are at fixed rates that change from time to time. Faculty stipends are individually negotiated, based upon the current University salary.

For more information about the ORAU program, contact Trina B. Karolchik or Professor Richard A. Bajura, WVU Energy and Water Research Center, 258 Stewart Street, Morgantown, WV 26506, or write to the University Programs Division, Oak Ridge Associated Universities, Inc., P.O. Box 117, Oak Ridge, TN 37830-0117.

Water Research Division

The Water Research Division (WRD) facilitates, coordinates, sponsors, and administers water research at WVU. Current major programs include the Geological Survey's Water Research Institute and the EPA National Small Flows Clearinghouse.

Water Research Institute

Research projects dealing with problems related to quality and quantity of water in West Virginia and the Mid-Atlantic Region are supported by this program. Research may focus on either the physical or social aspects of water related questions. Faculty and students from all colleges and universities in West Virginia are eligible to participate. Students should contact their department chairpersons to learn whether Wester Research Institute—funded assistantships in their intended field of study are available.

National Small Flows Clearinghouse

Funded by the U.S. Environmental Protection Agency (EPA), this national center for technology transfer helps government agencies and small communities to meet their wastewater treatment needs by gathering and releasing information on wastewater treatment systems designed to meet small communities' special needs. The Clearinghouse supports graduate students to conduct research on alternative wastewater treatment systems. The Clearinghouse also supports graduate students who are interested in computer data base systems used to disseminate information.

Housing Information and Research Center

The West Virginia University Housing Information and Research Center was established in 1981. The center's primary mission is to serve the general public and professionals in the field of housing and energy by providing consultant services, education programs, and demonstrations on alternative housing and energy. The center is administered by the technology education program in the College of Human Resources and Education. For further information call (304) 293-3803.

Technology Field Service Center

The Technology Field Service Center was established in 1970. The primary mission of the center is to provide consultant personnel, development and program design services for schools, businesses, and industries that have education and training needs in the technologies. The Center is administered by the Technology Education program in the College of Human Resources and Education. For further information call (304) 293-3803.

Harley O. Staggers National Transportation Center

In 1979, the U.S. Secretary of Transportation designated the first National Transportation Center at West Virginia University and recommended naming it for former Congressman Harley O. Staggers of West Virginia in recognition of his promotion of new and improved transportation systems.

The goal of the center is to develop and undertake research and educational activities which will help maintain and enhance the transportation infrastructure of West Virginia and the Appalachian region. The center is multidisciplinary and concerned with all modes of transportation in both the public and private sectors. Emphases are rural transportation, including highway, air, rail, and water modes, and public transportation. Research on Automated Guideway Transit is also undertaken due to the availability of WVU's Personal Rapid Transit (PRT) as a laboratory. Faculty members from different colleges and schools participate in research projects as associates of the center.

University Affiliated Center for Developmental Disabilities (UACDD)

Ashok S. Dey, Director.

The mission of the West Virginia University Affiliated Center for Developmental Disabilities (UACDD), established in 1975 at the College of Human Resources and Education, is to serve as a State DD Resource Center and assist in the provision of personnel training, to conduct service demonstration programs including research, technical assistance and outreach and to disseminate information to increase and support the independence, productivity, and integration into the community of developmentally disabled individuals of all ages.

The Center has qualified program coordinators in medicine, neurology, nursing, dentistry, nutrition, pharmacy, law, otolaryngology, psychology, ophthalmology, optometry, special education, social work, and speech pathology and audiology. The Center is funded by the U.S. Department of Health and Human Services/Administration on Developmental Disabilities.

West Virginia Rehabilitation Research and Training Center

The West Virginia Rehabilitation Research and Training Center was established in 1965 to carry out programmatic research in the area of disability and to apply information technology to enhance rehabilitation. This program is funded by the National Institute for Disability and Rehabilitation Research (NIDRR) of the U.S. Department of Education.

The Center conducts research on questions of relevance to rehabilitation and uses state-of-the-art information technology to facilitate operation and management of rehabilitation programs throughout the nation, serving approximately one million disabled individuals. Specifically, research is conducted to improve the decision-making process, develop a decision support system, study the dynamics of organizational structure and function and study strategic and tactical planning using forward and backward simulation techniques. The Center has a national data bank of longitudinal data on 10 million individuals served by the state-federal vocational rehabilitation program. A series of software packages geared toward the "rehabilitation office of tomorrow" has been developed as well as other computer programs such as simulation modeling, health-risk analysis, and wellness planning. The Center has developed many training programs utilizing teleconferencing, satellite broadcasts, and live on-site training/consultation. Requests for services and products developed by the Center have come from all fifty states and many foreign countries.

In addition to conducting rehabilitation research, the Center offers training/workshops, technical assistance, and consultations to rehabilitation practitioners throughout the nation. Research faculties have a multidisciplinary background including rehabilitation, psychology, medicine, computer science, economics, engineering, etc. The Center employs 40 persons, including graduate assistants from many disciplines in the University, and serves as an important part of graduate education at West Virginia University. The faculties of the Center serve on doctoral committees, and graduate assistants conduct rehabilitation research as part of their doctoral dissertations.

Part 7

GRADUATE FACULTY

Graduate faculty status is subject to periodic review and modification. Consequently, students should verify membership status with the appropriate faculty member prior to establishing graduate committees.

College of Agriculture and Forestry

Animal and Veterinary Sciences

Professors

William E. Collins,* Ph.D. (U. Wisc.). Bovine reproduction.
Robert A. Dailey, Ph.D. (U. Wisc.). Reproductive physiology.
Leslie Dozsa,* D.V.M. (C. Vet. Med., Budapest). Veterinary medicine.
William H. Hoover, Ph.D. (Penn St. U.). Animal nutrition.
Donald J. Horvath,* Ph.D. (Cornell U.). Nutrition. Physiology.
E. Keith Inskeep, Ph.D. (U. Wisc.). Reproductive physiology.
Paul E. Lewis, Ph.D. (WVU). Chairperson. Reproductive physiology.
William G. Martin, Ph.D. (WVU). Nutritional biochemistry.
Edward C. Prigge, Ph.D. (U. Maine). Animal nutrition.
Robert L. Reid, Ph.D. (Aberdeen U.). Ruminant nutrition.

Associate Professors

Ellen R. Jordan,* Ph.D. (Ore. St. U.). Extension Specialist. Reproductive physiology.
Richard R. Koes,* Ph.D. (U. Mo.). Extension Specialist. Nutrition.
Phillip I. Osborne,* Ph.D. (Clemson U.). Extension Specialist. Livestock marketing and production.
Ronald A. Peterson,* Ph.D. (Mich. St. U.). Nutrition. Physiology-poultry.
Wayne R. Wagner,* Ph.D. (Colo. St. U.). Extension Specialist. Animal breeding and genetics.

Assistant Professors

Ruth Blauwinkel,* D.V.M. (Mich. St.), Ph.D. (Wash. St.). Veterinarian.
Glen Carpenter, Ph.D. (Mich. St. U.). Extension Specialist, Poultry.
Hillar Klandorf, Ph.D. (U. Edinburgh). Poultry physiology.
Steven Lerner, Ph.D. (WVU). Reproductive physiology.
Robert McCurley, Ph.D. (U. Tenn.). Animal genetics.
Thomas Oscar, Ph.D. (N.C.U.). Growth and development.
Richard Russell, Ph.D. (Iowa St. U.). Animal nutrition.
Paul M. Smith,* M.S. (WVU). Food sciences.

Family Resources

Professors

Margaret Albrink, M.D. (Yale U.). Adjunct.
Wanda F. Franz, Ph.D. (WVU). Human development, Cognitive development theory.
Mary K. Head, R.D., Ph.D. (Purdue U.). Experimental foods, Applied human nutrition, Food and dietary evaluation.
Nora M. MacDonald, M.S. (Iowa St. U.). Apparel design, Clothing for special needs, Fashion merchandising.
M. Zafar Alam Nomani, Ph.D. (Rutgers U.). Dietary fiber, Cholesterol, Protein and energy metabolism, Nutritional assessment, International nutrition.

Associate Professor

Marian Beth Liddell, Ed.D. (WVU). Curriculum, Instruction, Supervision.
Barbara Warash,* M.S. (Fla. St. U.). Clinical Associate.

Assistant Professor

Sardi M. Ladki,* M.S. (U. Wisc.). Visiting.
Nancy R. Rodriguez, Ph.D. (WVU). Nutritional physiology, Intermediary metabolism, Clinical and applied nutrition.

*Associate Member

Forestry

Professors

Eugene C. Bammel, Ph.D. (Syracuse U.). Recreation and Parks. Leisure theory, Historical interpretation, Tourism.

Lei Lane Bammel, Ph.D. (U. Utah). Recreation and Parks. Leisure studies, Research designs.

Samuel M. Brock, Ph.D. (U. Minn.). Forest Management. Forest resource economics and management, Economics of conservation.

Jack E. Coster,* Ph.D. (Tex. A&M U.). Chairperson, Forestry. Forestry, Entomology.

Ray R. Hicks, Jr., Ph.D. (SUNY). Forest Management. Forest ecology, Forest pest management.

David M. Hix, Ph.D. (U. Wisc.). Forest management, Silviculture, Stand development.

Steven J. Hollenhorst, Ph.D. (Ohio St. U.). Recreation and Parks. Wilderness management.

Joseph M. Hutchinson, Jr.,* M.S. (WVU). Recreation and Parks. Recreation/parks management, Administration planning, Policy.

Norman D. Jackson,* M.W.T. (N.D. St. U.). Assistant Chairperson, Wood Science. Harvesting and primary manufacturing.

William E. Kidd, Jr.,* M.S.F. (VPI&SU). Extension Specialist, Forest Management. Forestry.

Edwin D. Michael, Ph.D. (Tex. A&M U.). Wildlife Management. Wildlife management, Wetland wildlife.

William Perry, Ph.D. (VPI&SU). Forestry sciences.

David E. Samuel, Ph.D. (WVU). Wildlife Management. Policy and administration, Wildlife attitudes, Hunter education.

Robert L. Smith, Ph.D. (Cornell U.). Wildlife Management. Habitat assessment, Ecology of disturbed ecosystems, Population ecology.

Stanislaw Jan Taichman, Ph.D. (U. Munich). Forest Management. Forest meterology.

David E. White, Ph.D. (SUNY). Forest Management. Forestry economics, Policy analysis.

Robert C. Whitmore, Ph.D. (B. Young U.). Wildlife Management. Avian ecology, Quantitative ecology.

Harry V. Wiant, Jr., Ph.D. (Yale U.). Forest Management. Mensuration, Silviculture.

Michael Wolcott, Ph.D. (VPI&SU). Forestry sciences.

David O. Yandle,* Ph.D. (N.C. St. U.). Forest Management. Forest biometrics, Statistics.

Associate Professors

James P. Armstrong, Ph.D. (SUNY). Wood Science. Physical properties and hardwood drying.

Patrick W. Brown, Ph.D. (U. Mo.). Adjunct. Cooperative Fish and Wildlife Unit. Wildlife management, Ecology.

F. Joseph Margraf, Ph.D. (Tex. A&M U.). Adjunct. Cooperative Fish and Wildlife Unit. Fisheries science, Ecology.

David E. Patterson, Ph.D. (Tex. A&M U.). Wood Science. Plant layout, Decision-making, Processing.

Sue A. Perry, Ph.D. (N. Tex. St. U.). Adjunct. Cooperative Fish and Wildlife Unit. Aquatic ecology.

Assistant Professors

Douglas G. Gardner, Ph.D. (Miss. St. U.). Wood Science. Adhesion chemistry.

Kurt C. Hassler, Ph.D. (VPI&SU). Leader, Appalachian Hardwood Center. Wood Science. Harvesting, Quantitative methods.

Beverly Hummel-Azzaro,* Ph.D. (WVU). Chairperson, Family Resources. Therapeutic recreation.

Plant and Soil Sciences

Professors

Robert E. Anderson,* Ph.D. (U. Wisc.). Extension. Agricultural microbiology. Environmental education.

Barton S. Baker, Ph.D. (WVU)—Chairperson. Agronomy. Forage crops.

John A. Balasko, Ph.D. (U. Wisc.). Agronomy. Forage crops.

John F. Baniecki,* Ph.D. (U. Ariz.). Extension. Plant Pathology. Plant disease identification and control.

Bradford C. Bearce,* Ph.D. (U. Calif.). Horticulture. Florist and nursery crops.

Gary K. Bissonnette, Ph.D. (Mont. St. U.). Agricultural Microbiology. Aquatic microbiology, Environmental microbiology.

William B. Bryan, Ph.D. (Iowa St. U.). Agronomy. Pastures.

Linda Butler, Ph.D. (U. Ga.). Entomology. Forest entomology, Pest management, Lepidoptera.

Dale F. Hindal, Ph.D. (Iowa St. U.). Mycology. Fungal physiology, Mycorrhizae, Biocontrol, Diseases of forest and shade trees.

L. Morris Ingle, Ph.D. (Purdue U.). Horticulture. Post-harvest physiology of tree fruits.

*Associate Member

Walter J. Kaczmarczyk,* Ph.D. (Hahnemann Med. C.). Genetics. Biochemical genetics.
Robert E. Keefer, Ph.D. (Ohio St. U.). Agronomy. Soil fertility. Organic matter and soil conservation.
William L. MacDonald,* Ph.D. (Iowa St. U.). Plant Pathology. Forest and shade tree diseases.
Joginder Nath, Ph.D. (U. Wisc.). Genetics. Cytogenetics, Evolution, Mutagenesis.
John C. Sencindiver, Ph.D. (WVU). Agronomy. Soil Science, Soil genesis and classification, Acid mine drainage.
Rabindar N. Singh, Ph.D. (VPI&SU). Agronomy. Soil chemistry and mineralogy.
Suman Singha, Ph.D. (Cornell U.). Horticulture. Tree fruits, Micropropagation.
Charles B. Sperow, Jr.,* M.S. (WVU). Extension. Agronomy. Crops agronomy.
David A. Stelzig, Ph.D. (N.D. St. U.). Agricultural Biochemistry. Biochemical plant pathology.
Valentin Ulrich,* Ph.D. (Rutgers U.). Genetics. Biochemical genetics and plant breeding.
Willem A. van Eck,* Ph.D. (Mich. St. U.). Extension Specialist, Soil Science. Soil and water resources.
Robert J. Young,* Ph.D. (Ore. St. U.). Plant pathology. Vegetable diseases.
Richard K. Zimmerman,* Ph.D. (WVU). Extension, Plant Sciences. Plant sciences, Conservation.

Associate Professors

James W. Amrine, Jr., Ph.D. (Iowa St. U.). Entomology. Medical entomology, Apiculture, Biological control.
Tara Baugher, Ph.D. (WVU). Extension. Horticulture, Tree fruits.
Alan R. Biggs, Ph.D. (Penn. St. U.). Plant pathology, Tree fruits.
James L. Brooks, Ph.D. (U. Calif.). Agricultural Biochemistry. Enzymes and plant biochemistry.
Henry W. Hogmire, Ph.D. (Mich. St. U.). Entomology. Tree fruit entomology, Integrated pest management.
Everett M. Jencks,* Ph.D. (Rutgers U.). Agronomy. Soil chemistry.
Joseph B. Morton, Ph.D. (Mont. St. U.). Plant Pathology. Mycorrhizal interactions, Field crop diseases.
Alan J. Sextone, Ph.D. (Mich. St. U.). Agricultural Microbiology. Nutrient cycling and biodegradation of pollutants.
Joseph E. Weaver, M.S. (WVU). Entomology.

Assistant Professors

James B. Kotcon, Ph.D. (U. Wisc.). Plant Pathology. Nematology, Soil-bourne diseases.
Juanita Popenoe, Ph.D. (Wash. St. U.). Horticulture, Small Fruits.
Jeffrey Skousen, Ph.D. (Tex. A&M U.). Agronomy. Soil science, Land reclamation.

Resource Management

Professors

Alfred L. Barr, Ph.D. (Okla. St. U.). Associate Director, Agricultural and Forestry Experiment Station.
Clifford W. Collier, Jr.,* M.L.A. (U. Ga.). Extension Landscape Architect. Architecture.
Dale K. Colyer, Ph.D. (U. Wisc.). Agricultural Economics. Production economics, Rural development.
Robert G. Diener, Ph.D. (Mich. St. U.). Agricultural Mechanics. Electricity, Agricultural mechanization research.
Anthony Ferrise,* M.S. (WVU). Extension. Rural development.
Robert L. Jack,* Ph.D. (Penn St. U.). Agricultural Economics. Marketing, Agribusiness.
Alon Kvashny, Ed. D. (WVU). Landscape Architecture. Site design, Landscape construction.
Lyle D. Lawrence, Ph.D. (LSU). Agricultural education. Social science research, Curriculum development, Teaching methods.
George W. Longenecker,* M.F.A. (U. Ill.). Landscape Architecture. Plant identification, Planting design.
Robert H. Maxwell,* Ph.D. (Iowa St. U.). Dean of the College of Agriculture and Forestry, Agricultural Education.
Kenneth D. McIntosh,* Ph.D. (U. Wisc.). Associate Dean for Instruction, College of Agriculture and Forestry.
Virgil J. Norton, Ph.D. (Ore. St. U.). Chairperson. Agricultural and resource economics.
Dennis K. Smith, Ph.D. (Penn St. U.). Agricultural Economics. Rural development.
Delmar R. Yoder,* Ph.D. (U. Wisc.). Extension. Resource development.

Associate Professors

Donald R. Armstrong,* M.L.A. (Iowa St. U.). Landscape Architecture. Site design, Design implementation.
Kendall C. Elliott, M.S.Ag.E. (WVU). Agricultural Mechanics. Engines, Hydraulics, Agricultural mechanization research.

*Associate Member

Jerald J. Fletcher, Ph.D. (U. Cal.). Agricultural Economics. Resource economics.
Stacy A. Gartin, Ph.D. (Ohio St. U.). Communications, Program planning, Leadership development.
Tesfa Gebremedhin, Ph.D. (Okla. St. U.). Visiting. Agricultural Economics. Farm management, Agribusiness.
Alexander G. Karther,* M.F.A. (U. Okla.). Landscape Architecture. Design communication, Design methodology.
Steven B. McBride,* M.L.A. (U. Mass.). Landscape Architecture. Landscape construction, Site design.
Tim T. Phipps, Ph.D. (U. Cal.). Agricultural Economics. Resource economics.

Assistant Professors

Alan R. Collins, Ph.D. (Ore. St. U.). Agricultural Economics. Resource economics.
Gerard E. D'Souza,* Ph.D. (Miss. St. U.). Agricultural Economics. Farm management, Production economics, Finance.
Kerry S. Odell, Ph.D. (Ohio St. U.). Agricultural Education. Research methodology, Microcomputer applications, Teaching methods.
Charles B. Yuill,* M.L.A. (U. Mass.). Landscape Architecture. Computer applications, Site analysis.

College of Arts and Sciences

Biology

Professors

David F. Blaydes,* Ph.D. (Ind. U.). Plant physiology, Cytokinins.
Roy B. Clarkson, Ph.D. (WVU). Plant systematics, Floristics.
John J. DeCosta, Ph.D. (Ind. U.). Limnology, Ecology, Invertebrate biology.
Edward C. Keller, Jr., Ph.D. (Penn St. U.). Ecology, Genetics.
Gerald E. Lang, Ph.D. (Rutgers U.)—Dean. Plant ecology, Biogeochemistry, Wetland ecology.
Dennis C. Quinlan, Ph.D. (U. Rochester)—Assistant Dean. Cellular/molecular biology, Cell membranes, Cancer biology.
Richard P. Sutter, Ph.D. (Tufts U.). Cellular/molecular biology, Developmental biology, Molecular genetics.

Associate Professors

Roland L. Guthrie,* Ph.D. (WVU). Plant anatomy, Morphology, Dendrology.
Joseph A. Marshall, Ph.D. (U. Md.). Animal behavior, Ichthyology, Aquaculture.
James B. McGraw, Ph.D. (Duke U.). Plant ecology, Plant physiology.
Leah A. Williams,* Ph.D. (WVU) Chairperson. Cellular/molecular biology, Developmental biology, Vertebrate anatomy.

Assistant Professors

Patricia E. Gallagher, Ph.D. (U. Tenn.). Cellular/molecular biology, DNA repair enzymes.
Keith Garbutt, Ph.D. (U. Wales). Population genetics, Plant ecology.
Karen S. Katula, Ph.D. (Northwestern U.). Cellular/molecular biology, Molecular genetics, Recombinant DNA.
Michael A. Kotarski, Ph.D. (cornell U.). Cellular/molecular biology, Developmental genetics.
Deborah A. Leonard, Ph.D. (Cornell U.). Cholesterol metabolism in cultured mammalian cells, Regulation of cell proliferation.

Chemistry

Professors

Naresh S. Dalal, Ph.D. (U. Brit. Columbia). Physical chemistry, Magnetic resonance, Fossil fuels.
Gabor B. Fodor, Ph.D. (U. Szeged, Hungary) Centennial Professor Emeritus. Organic chemistry, Natural products, Synthesis.
Denis W. H. MacDowell,* Ph.D. (MIT). Organic chemistry, Synthesis, Thiophenes.
William R. Moore,* Ph.D. (U. Minn.). Organic chemistry, Strained molecules, Reaction mechanisms.
Chester W. Muth,* Ph.D. (Ohio St. U.) Emeritus.
Robert S. Nakon, Ph.D. (Tex. A&M U.). Bioinorganic chemistry, Chelates, Catalysis.
Jeffrey L. Petersen, Ph.D. (U. Wisc.). Physical inorganic chemistry, Transition metal complexes, X-ray diffraction.
Kenneth Showalter, Ph.D. (U. Colo.). Physical chemistry, Chemical kinetics, Multistability and oscillating systems.

*Associate Member

Anthony Winston, Ph.D. (Duke U.)—Chairperson. Organic chemistry, High polymers, Metal chelating polymers.

Associate Professors

Paul W. Jagodzinski, Ph.D. (Tex. A&M U.)—Associate Chairperson. Biophysical chemistry, Raman spectroscopy, Enzyme structures, Molecular spectroscopy.

John H. Penn, Ph.D. (U. Wisc.). Organic chemistry, Photochemistry, Electron transfer.

Ronald B. Smart, Ph.D. (U. Mich.). Environmental analytical chemistry, Electrochemistry, Trace metals.

Kung K. Wang, Ph.D. (Purdue U.). Organic chemistry, Stereoselective synthesis, Natural products.

Assistant Professors

Harry O. Finkle, Ph.D. (Calif. Inst. Tech.). Analytical/physical chemistry, Properties of organized monolayers deposited on electrodes.

Charles Gibson, Ph.D. (U. Wisc.). Inorganic chemistry, Metal clusters.

Charles Jaffe, Ph.D. (U. Colo.). Theoretical chemistry, Molecular dynamics, Nonlinear mechanics.

Raymond J. Lovett, Ph.D. (Ariz. St. U.). Analytical chemistry, Computer simulating in analysis, trace metal determinations, and interaction of chemicals with solids.

Plato A. Magriotis, Ph.D. (SUNY). Organic chemistry, Organic synthesis and bio-organic chemistry.

Alan M. Stolzenberg, Ph.D. (Stanford U.). Inorganic chemistry, Bioinorganic chemistry, Organometallic chemistry.

Communication Studies

Professors

Leonard M. Davis, Ph.D. (Northwestern U.). Organizational communication, Communication problems of children, Rhetoric and communication theory.

Donald W. Klop, Ph.D. (U. Wash.). Intercultural communication, Small-group communication, Persuasion.

James C. McCroskey, Ed.D. (Penn St. U.)—Chairperson. Communication avoidance, Communication in instruction, Interpersonal and organizational communication.

Virginia P. Richmond, Ph.D. (U. Nebr.). Interpersonal and organizational communication, Nonverbal communication, Communication in instruction.

Lawrence R. Wheless, Ph.D. (Wayne St. U.)—Associate Chairperson. Interpersonal and organizational communication, Empirical methodology, Communication in instruction.

Associate Professor

Joan S. Gorham, Ed.D. (Northern Ill. U.). Communication in instruction, Nonverbal communication, Mass communication.

Walter R. Zakahi, Ph.D. (Bow. Grn. U.). Interpersonal communication, Nonverbal communication, Research methodology.

Assistant Professors

Melanie Booth-Butterfield, Ph.D. (U. Mo.). Interpersonal communication, Nonverbal communication, Communication in instruction.

Steven Booth-Butterfield,* Ed.D. (WVU). Mass communication, Interpersonal communication, Communication in instruction, Persuasion.

K. David Roach,* Ph.D. (Tex. Tech. U.). Organizational communication, public communication, Interpersonal communication, Communication in instruction.

Computer Science and Statistics

Professors

Donald F. Butcher,* Ph.D. (Iowa St. U.)—Chairperson Statistics. Design and analysis of experiments, Monte Carlo simulation, Regression analysis.

Erdogan Gunel, Ph.D. (SUNY Buffalo) Statistics. Bayesian inference, Categorical data analysis, Biometry.

E. James Harner, Jr., Ph.D. (Cornell U.) Statistics. Robust estimation, Statistical computation, Modeling observational studies.

Franz X. Hiergeist, Ph.D. (U. Pitt) Mathematics of computation, Computer design.

Malcolm G. Lane, Ph.D. (Duke U.) Computer Science. Data communications, Operating systems, Software engineering.

Wayne A. Muth,* Ph.D. (Iowa St. U.)—Associate Chairperson. Computer Science. Simulation, Mathematical modeling, Computer performance.

Y. V. Reddy, Ph.D. (WVU) Computer Science. Artificial intelligence, Knowledge based simulation, Computer graphics.

William V. Thayne, Ph.D. (U. Ill.) Statistics. Statistical genetics, Regression analysis.

*Associate Member

George E. Trapp, Ph.D. (Carnegie-Mellon U.) Computer Science. Numerical analysis, Mathematical programming, Network models.
Stanley Wearden, Ph.D. (Cornell U.) Statistics. Biometrics, Statistical genetics, Population biology.

Associate Professors

John M. Atkins, Ph.D. (U. Pitt) Computer Science. Design of database management systems, Analysis of algorithms, Mathematics of computation.
Daniel M. Chilko,* M.S. (Rutgers U.) Statistics. Statistical computing, Computer graphics.
William H. Dodrill, M.S. (Columbia U.) Computer Science. Microcomputer applications, Computers in medicine.
Shirley M. Dowdy,* Ph.D. (U. Notre Dame) Statistics. Sampling, Statistical methods, Software for statistical education.
D. Michael Henry, Ph.D. (TCU) Computer Science. Databases, Cryptography, Microcomputer interfacing.
Gerald R. Hobbs, Jr., Ph.D. (Kans. St. U.) Statistics. Nonparametric statistics, Regression analysis.
James D. Mooney, Ph.D. (Ohio St. U.) Computer Science. Operating systems, Text processing, Computer architecture.
Frances L. Van Scy, Ph.D. (U. Va.) Computer Science. Programming languages and compilers, Software development environments, Parallel processing.

Adjunct Professors

Thomas J. O'Brien,* Ph.D. (U. Wisc.) Computer Science. Numerical analysis, Mathematical modelling, Numerical simulation.
Tuncer J. Oren,* Ph.D. (U. Ariz.) Computer Science. Artificial intelligence, Software engineering, Simulation.

Adjunct Associate Professor

Thomas D. Morley,* Ph.D. (Carnegie-Mellon U.) Computer Science. Electrical networks, Functional analysis, Combinatorics.

Adjunct Assistant Professors

Rodolphe Nassif,* Ph.D. (Inst. Natl. Poly., France) Computer Science. Information systems, Distributed database management systems.
Martin R. Petersen,* Ph.D. (N.C. St.) Statistics. Design and analysis.

English

Professors

Sophia B. Blaydes, Ph.D. (Ind. U.) 17th and 18th century literature, Poetry, Drama.
Lloyd M. Davis, M.A. (Vanderbilt U.) American literature, Contemporary American poetry.
William W. French, Ph.D. (U. Pitt) Shakespeare and Renaissance drama and literature, Contemporary theatre, Modern drama.
Elaine K. Ginsberg,* Ph.D. (U. Okla.) Contemporary women writers, Virginia Woolf, Early American literature.
Patrick O'Donnell, Ph.D. (U. Calif.-Davis) Eberly Professor. Contemporary American fiction, Critical theory, Modern American literature, History and theory of the novel.
Virgil L. Peterson,* Ph.D. (UCLA) Writing, Biography, Peace studies.
John Racin, Jr.,* Ph.D. (Ohio St. U.) Shakespeare, English Renaissance poetry, prose, and drama, Chekhov.
Frank Scafella, Jr., Ph.D. (U. Chicago) American novel, American romantics, Literature and religion, Science fiction/fantasy.
John F. Stasny, M.A. (U. Minn.) Victorian studies, Journal editing, Humanities.
Judith G. Stitzel, Ph.D. (U. Minn.) Director, Center for Women's Studies. Women's studies, Feminist pedagogy.

Associate Professors

Timothy D. Adams, Ph.D. (Emory U.) American literature, Autobiography Southern literature.
Dennis Allen, Ph.D. (U. Minn.) Critical theory, Prose fiction.
Rudolph P. Almasy,* Ph.D. (U. Minn.)—Chairperson. Renaissance and Reformation studies, Composition.
Arthur C. Buck,* Ph.D. (U. Ark.) Jean Girardoux, Comparative modern drama, Comparative romanticism, Chinese/Japanese literature in translation.
Patrick Connor, Ph.D. (U.Md.) Old and Middle English literature, Paleography.
Richard B. Eaton, Jr., Ph.D. (U. N.C.) 19th and 20th century American literature, Eugene O'Neill.
Anna Shannon Elfenbein, Ph.D. (U. Nebr.) Southern literature, Black fiction, Women's studies.
Anita Gandolfo, Ph.D. (CUNY) Modern literature, Composition pedagogy, Editing original material.

*Associate Member

Avery F. Gaskins,* Ph.D. (Ind. U.). Romantic literature, Wordsworth.
 Ellesa C. High,* Ph.D. (Ohio U.). Appalachian literature, Twentieth-century literature, Creative writing.
 Russell C. MacDonald,* Ph.D. (U. Penn). 18th century British literature, British novel, Modern short story, Creative writing.
 Thomas J. Miles, Ph.D. (SUNY). Medieval and Renaissance studies, rhetoric, psychoanalytical and mythological criticism, scientific and technical writing.
 Byron C. Nelson, Ph.D. (U. Wisc.). 17th century literature, Music and literature.
 Dorothy Sedley,* M.A. (Sonoma St. C.). Linguistics, Grammar, Technical writing.
 Cheryl B. Torsney, Ph.D. (U. Fla.). American fiction, Women's writing, Literary theory.
 Barry Ward, Ph.D. (Ohio St. U.). Folklore, Medieval literature, American studies.
 Hayden Ward, Ph.D. (Columbia U.). Victorian literature, Walter Pater.

Assistant Professors

Winston Fuller,* M.A. (U. Colo.). Modern poetry, Poetics.
 Richard Isomaki,* Ph.D. (U. Wash.). 19th century British literature, History of criticism, Literary theory.
 Elizabeth Madison,* Ph.D. (Ind. U.). Comparative literature.
 Kevin Oderman, Ph.D. (U. Calif.). Pound, H.D., Williams and their heirs, Continental moderns, Literary essay.
 Susan Shaw Sailer,* Ph.D. (U. Wash.). Modern British literature, Irish literary renaissance, Literary theory, Epics.
 Aileen K. Shaffer,* M.A. (WVU). American literature, Business writing.
 Susan Thomas,* Ph.D. (U. Penn.). Linguistics, History and structure of English, Technical and scientific writing, Non fiction prose styles.

Foreign Languages

Professors

Robert J. Elkins,* Ph.D. (U. Kans.)—Chairperson. German. Language methodology, German radio plays, English as a second language.
 Joseph A. Murphy, Ph.D. (Ohio St. U.). French. English as a second language, Foreign language education.
 Joseph J. Prentiss,* Ph.D. (U. Pitt). Classics. Greek and Latin literature, Classical mythology.
 Janice Spleth, Ph.D. (Rice U.). French. Francophone literature and culture, 19th century French drama.
 M. Stanley Whitley, Ph.D. (Cornell U.). Linguistics, Spanish. Sociolinguistics, Phonology, History of linguistics.

Associate Professors

Marilyn Bendena,* Ph.D. (Wayne St. U.). French, Russian. Russian literature/culture, Contemporary French novel.
 Axel W. Claeges, Ph.D. (Vanderbilt U.). German. German cultural and intellectual history, 19th century German literature, Commercial German.
 Ronald W. Dunbar,* Ph.D. (U. Wisc.)—Associate Chairperson. German. German linguistics and philology, Middle high German.
 Pablo Gonzalez, Ph.D. (U. Madrid). Spanish. Spanish-American literature, Commercial Spanish.
 Lois V. Hinckley, Ph.D. (U. N.C.). Classics. Roman/Greek literature and civilization.
 Michael E. Reider, Ph.D. (U. Iowa). Spanish, Linguistics. Syntax and phonology, Psycholinguistics.
 Joseph F. Renahan,* M.S. (Yeshiva U.). Spanish. French and Spanish philology, Spanish Golden Age drama.
 Jurgen Schlunk, Ph.D. (U. Marburg). German. 18th century German literature, 19th and 20th century German drama.

Assistant Professors

Kuan-Yi Rose Chang,* Ph.D. (Purdue U.). TESL/Spanish. Language teaching methodology, Computer-assisted language learning.
 Sandra Dixon,* Ph.D. (Brown U.). Latin American, Spanish, and Portuguese literature.
 Ahmed Fakri, Ph.D. (U. Mich.). TESL. Second language acquisition, Applied linguistics, Discourse analysis.
 Daniel Ferreras,* Ph.D. (Mich.St.U.). Comparative Romance literature. French/Spanish 19th and 20th century novel, Theory of the fantastic.
 Michael Lastinger, Ph.D. (U. Ga.). French. 19th century French literature, Critical theory.
 Valerie Lastinger, Ph.D. (U. Ga.). French. 18th century French literature, French women writers.
 Chantal Marechal,* Ph.D. (U. Mich.). Medieval French literature.

*Associate Member

Geology and Geography

Professors

Robert E. Behling,* Ph.D. (Ohio St. U.). Geomorphology.
Alan C. Donaldson, Ph.D. (Penn St. U.)—Chairperson. Sedimentation-stratigraphy.
Milton T. Heald,* Ph.D. (Harvard U.). Emeritus. Mineralogy and petrology.
Andrew Isserman, Ph.D. (U. Penn.). Regional research.
Kenneth C. Martis, Ph.D. (U. Mich.). Political resource and environmental policy.
Henry W. Rauch, Ph.D. (Penn St. U.). Hydrogeology and geochemistry.
John J. Renton, Ph.D. (WVU). Geochemistry.
Robert C. Shumaker, Ph.D. (Cornell U.). Geophysics.
Richard A. Smosna, Ph.D. (Ill. U.). Carbonate sedimentation.

Associate Professors

Frank J. Calzonetti, Ph.D. (U. Okla.). Energy and regional development, Industrial location.
Gregory A. Elmes, Ph.D. (Penn St. U.). Spatial modeling, Transportation.
Robert Q. Hanham, Ph.D. (Ohio St. U.). Urban and regional systems, Geostatistics.
Trevor Harris, Ph.D. (U. Hull). Geographic information systems.
Thomas W. Kammer, Ph.D. (Ind. U.). Paleontology.
J. Steven Kite, Ph.D. (U. Wisc.). Geomorphology.
Thomas H. Wilson, Ph.D. (WVU). Geophysics.

Assistant Professors

Ronald Harris, Ph.D. (V. College, London). Structural geology.
Helen Lang, Ph.D. (U. Ore.). Petrology and mineralogy.
John Pickles, Ph.D. (Penn St. U.). Geographic theory, Africa.
Lizabeth A. Pyle, Ph.D. (U. Minn.). Visiting. Resource management, Land use policy, Agriculture, United States and Canada.
Robert T. Walker,* Ph.D. (U. Penn). Regional science.

History

Professors

Wesley M. Bagby, Ph.D. (Columbia U.). Recent United States. U.S. diplomatic.
Emory L. Kemp, Ph.D. (U. Ill.)—Director, *Institute for the History of Technology and Industrial Archeology*. History of science, Technology, Industrial archeology, 19th century engineering.
Ronald L. Lewis, Ph.D. (U. Akron). Modern United States. West Virginia/Appalachia, Labor, Ethnic relations.
Robert M. Maxon, Ph.D. (Syracuse U.)—Chairperson. Africa. East Africa, Economic and imperial.
John C. Super, Ph.D. (UCLA)—Associate Chairperson. Latin America, Spain, Biography, Food and agriculture.

Associate Professors

William S. Arnett,* Ph.D. (Ohio St. U.). Ancient. Egyptology, Aging and elderly in the ancient Middle East.
Robert E. Blobaum, Ph.D. (U. Nebr.). Russia, East Europe. Poland, 20th century political and social history.
Gregory A. Good, Ph.D. (U. Toronto). History of science and technology, History of science in 18th-20th century U.S. and Europe.
Jack L. Hammersmith, Ph.D. (U. Va.). Modern United States. East Asia, U.S. diplomatic, U.S.-Japanese relations.
Barbara J. Howe, Ph.D. (Temple U.). Modern United States. Public history, U.S. urban and women's history.
Elizabeth K. Hudson, Ph.D. (Ind. U.). Renaissance and Reformation. Education and religion.
John A. Maxwell, Ph.D. (WVU). Modern Europe. East and West Germany, Military history.
Stephen C. McCluskey, Ph.D. (U. Wisc.). Medieval science and technology. Astronomies of non-literate cultures.
W. Reynolds McLeod,* Ph.D. (U. Md.). Great Britain. Celtic Europe (Scotland), Popular history, Newspaper history.
Dennis H. O'Brien,* Ph.D. (U. Ill.). Early modern Europe. France, Diplomatic history.
George P. Parkinson, Jr.,* Ph.D. (U. Wisc.). Early United States. Colonial and Antebellum, Appalachian history and archives.

Assistant Professor

Michael Jakobson, Ph.D. (U. Minn.). Modern Europe. Soviet Union, Soviet prisons, state institutions.
Mary Lou Lustig, Ph.D. (Syracuse U.). Early United States. Colonial, Revolutionary, Constitutional.

*Associate Member

John R. McKivigan, Ph.D. (Ohio St. U.). 19th century United States. Civil War-Reconstruction, reform, ethnic.

Library Science

Associate Professors

Elizabeth F. Howard,* Ph.D. (U. Pitt). Children's and young adults' literature, School librarianship.

Harold B. Shill, Ph.D. (U. N.C.)

Assistant Professor

Barbara Mertins,* M.S.L.S. (Syracuse U.). Bibliographic instruction, Children's literature, School librarianship.

Mathematics

Professors

Harvey R. Diamond, Ph.D. (MIT). Applied probability.

Harry Gingold, D.Sc. (Israel Inst. Tech.). Differential equations, Perturbation methods, Numerical computational methods.

Jack T. Goodykoontz, Jr., Ph.D. (U. Ky.). General topology.

Henry W. Gould, M.A. (U. Va.). Combinatorics, Number theory, Special functions.

Caulton L. Irwin, Ph.D. (Emory U.)—Associate Director, Energy Research Center. Variational methods, Optimization, Applied mathematics.

Alonzo F. Johnson, Ed.D. (Okla. St. U.). Mathematics for teachers.

Jin Bai Kim, Ph.D. (VPI&SU). Algebra, Semigroups.

Michael E. Mays, Ph.D. (Penn St. U.). Number theory.

Sam B. Nadler, Jr., Ph.D. (U. Ga.). Topology, Functional analysis.

William H. Simons,* Ph.D. (Carnegie-Mellon U.). Analysis, Differential equations, Applied mathematics.

Associate Professors

Ian Christie, Ph.D. (Dundee U.). Numerical partial differential equations.

James E. Dowdy,* Ph.D. (Okla. St. U.). Homological algebra.

Harumi Hattori, Ph.D. (R.P.I.). Differential equations, Continuum mechanics, Numerical analysis.

James H. Lightbourne,* Ph.D. (N.C. St. U.)—Associate Chairperson. Differential equations.

James E. Miller,* Ph.D. (U. Ky.). Complex analysis.

James L. Moseley, Ph.D. (Purdue U.). Partial differential equations.

Cun-Quan Zhang, Ph.D. (Simon Fraser U.). Combinatorics, Graph theory.

Assistant Professors

Krzysztof Ciesielski, Ph.D. (Warsaw U.). Analysis, Topology.

Gary Ganser, Ph.D. (Rensselaer Polytechnic Inst.). Applied mathematics, Fluid mechanics.

Andrzej Karwowski,* Ph.D. (Rutgers U.). Continuum mechanics.

Hong-Jian Lai, Ph.D. (Wayne St. U.). Combinatorics, Graph theory.

Dening Li, Ph.D. (Fudan U.). Partial differential equations.

Robert Mayes,* Ph.D. (Kansas St. U.). Mathematics education.

Willem A. Schreuder, Ph.D. (U. Stellenbosch). Numerical analysis.

Philosophy

Professors

Ralph W. Clark, Ph.D. (U. Colo.). Business ethics, Metaphysics.

Theodore M. Drange,* Ph.D. (Cornell U.). Epistemology, Philosophy of science, Philosophy of religion.

Virginia H. Klenk, Ph.D. (U. Pitt)—Chairperson. Logic, Philosophy of mathematics.

Henry L. Ruf, Ph.D. (Emory U.). Philosophy of language, Comparative philosophy.

Mark R. Wicclair, Ph.D. (Columbia U.). Philosophy of law, Medical ethics.

Assistant Professor

Stephen C. Hetherington, Ph.D. (U. Pitt). Epistemology, Metaphysics, Philosophy of language.

Richard A. Montgomery, Ph.D. (U. Ill., Chicago). Philosophy of psychology, Philosophy of science.

Daniel Shapiro, Ph.D. (U. Minn.). Social and political philosophy, Ethics.

*Associate Member

Physics

Professors

Atam P. Arya,* Ph.D. (Penn St. U.). Nuclear spectroscopy.
Bernard R. Cooper, Ph.D. (U. Calif.)—Claude Worthington Benedum Professor of Physics. Surface electronic structure, Rare earth magnetism, Theory.
Martin V. Ferer, Ph.D. (U. Ill.). Phase transitions and critical phenomena, Theory.
Frank A. Franz, Ph.D. (U. Ill.)—Provost. Atomic physics, Optical pumping, Experiment.
Judy R. Franz,* Ph.D. (U. Ill.). Phase transitions, Solid state theory.
Arnold D. Levine,* Ph.D. (Columbia U.). Field theory.
John E. Littleton, Ph.D. (U. Rochester). Astrophysics, Nucleosynthesis, Theory and experiment.
Pedro A. Montano, D.Sc. (Technion). Adjunct. Surface physics, Mossbauer effect, Experiment.
Arthur S. Pavlovic, Ph.D. (Penn St. U.)—Chairperson. Magnetic properties of solids, Experiment.
Carl A. Rotter,* Ph.D. (Case W. Res. U.)—Associate Chairperson. Neutron scattering, Ultrasonics, Experiment.
Mohindar S. Seehra, Ph.D. (U. Rochester). Magnetic, electronic, optical properties of solids, Experiment.
Richard P. Treat,* Ph.D. (U. Calif.). Aerosol physics, Experiment, Theory.
William E. Vehse, Ph.D. (CMU)—Associate Provost. Optical properties of solids, Experiment.

Assistant Professors

Wathiq Abdul-Razzaq, Ph.D. (U. Ill., Circle). Solid state physics, Experiment.
Boyd F. Edwards, Ph.D. (Stanford U.). Fluid dynamics, Combustion processes, Percolation, Theory.
Nancy C. Giles, Ph.D. (N.C. St. U.). Optical properties of semiconductors, Experiment.
Mark E. Koepke, Ph.D. (U. Maryland). Plasma physics, Experiment.
H. Arthur Weldon, Ph.D. (MIT). Particle physics, Quantum fields, Theory.
Lane C. Wilson, Ph.D. (Stanford U.). Materials deposition, X-ray diffraction, Experiment.

Political Science

Professors

David A. Bingham,* Ph.D. (U. Iowa). State and local government, Intergovernmental relations.
Robert E. DiClerico, Ph.D. (Ind. U.). American government, Presidency, Parties and electoral processes, Public policy (agenda setting).
Hong N. Kim, Ph.D. (Georgetown U.). Comparative politics (Asia), Comparative public policy.
Rodger D. Yeager, Ph.D. (Syracuse U.). Comparative politics (Africa, political development), Public policy (natural resources and environment).

Associate Professors

Robert D. Duval, Ph.D. (Fla. St. U.). Methodology, International politics and policy, Public policy (energy).
Allan H. Hammock,* Ph.D. (U. Va.) Chairperson. American government, Public policy (civil rights, health care).
David M. Hedge, Ph.D. (U. Wisc.). Legislative politics, Regulation, Intergovernmental relations, Public policy (general).
Joseph Stewart, Jr., Ph.D. (U. Houston). Public policy, Administrative law and regulation, American politics.

Assistant Professor

Richard A. Brisbin, Jr., Ph.D. (Johns Hopkins U.). Public law and judicial politics, Public policy (criminal justice and regulation).
Susan Hunter, Ph.D. (Ohio St. U.). Public policy (environment, policy design, ethics), Contemporary political theory.

Psychology

Professors

James F. Carruth,* Ph.D. (U. Ill.)—Director, WVU Counseling Service. Developmental patterns of students.
Stanley H. Cohen, Ph.D. (Mich. St. U.)—Associate Chairperson. Quantitative methods, Applications of computers in behavioral sciences, Multivariate analysis.
Philip E. Comer,* Ph.D. (WVU)—Associate Director, WVU Counseling Service. Adjustment and developmental aspects of college life, Counseling and psychotherapy, Psychopathology, Diagnostic methods.
Barry A. Edelstein, Ph.D. (Memphis St. U.). Social competence, Behavioral assessment, Behavior therapy.
Sharon L. Foster, Ph.D. (SUNY Stony Brook). Social skills assessment and training with children, Family communication, Behavioral observation.

*Associate Member

William J. Fremouw, Ph.D. (U. Mass.)—Chairperson. Cognitive-behavioral therapy, Eating disorders.

Robert P. Hawkins, Ph.D. (U. Pitt). Behavior analysis of child behavior, Behavioral assessment, Child treatment programs.

Kennon A. Lattal, Ph.D. (U. Ala.). Reinforcement theory response-reinforcer relations, Laboratory research with animals for human behavior.

Hayne W. Reese, Ph.D. (U. Iowa)—Centennial. Cognitive development across the life-span, Life-span research methodology, Philosophical analysis.

Associate Professors

Edward C. Caldwell, Ph.D. (Syracuse U.). Evaluation of educational practices, Basic research in reading.

Philip N. Chase, Ph.D. (U. Mass.). Verbal behavior, Concept learning, Individualized instruction, Organizational behavior management.

E. Mark Cummings, Ph.D. (UCLA). Early socioemotional development, Development of behavioral disorders, Daycare, Development of aggression.

Michael Franzen, Ph.D. (S. Ill. U.). Neuropsychological assessment and rehabilitation, Psychometric theory, Statistics.

Irving J. Goodman, Ph.D. (U. Rochester). Neural mechanisms of behavior, Psychopharmacology, Behavioral neuroscience.

Anita L. Greene, Ph.D. (Boston U.). Cognitive development in adolescence, Stress in childhood and adolescence.

Katherine Karraker, Ph.D. (Mich. St. U.). Infant social development, Physical appearance effects on development, Parent-infant relations.

B. Kent Parker, Ph.D. (U. Utah). Conditioning and learning, Animal cognition, stimulus control and memory, Research design and statistics.

Michael Perone, Ph.D. (U. Wisc. Milwaukee). Basic processes in the operant behavior of humans and animals, Research methodology, Laboratory application of microcomputers, Radical behaviorism.

Richard J. Seime, Ph.D. (U. Minn.)—Chief, Psychology Section, WVU Health Sciences Center. Behavioral medicine, Conditional nausea and vomiting in cancer patients, Eating disorders, Psychology, Psychotherapy, Psychological testing.

Assistant Professors

Mark Alavosius, Ph.D. (U. Mass.). Organizational behavior management, applied behavior analysis, training and supervision of human service employees.

Andrew S. Bradlyn, Ph.D. (U. Miss.). Pediatric behavioral medicine, Child behavior therapy and assessment.

Virginia L. Goetsch, Ph.D. (U. Ga.). Behavioral medicine, Psychophysiology of stress, Anxiety disorders.

David J. Hansen, Ph.D. (U. Miss.). Child abuse and neglect, Social skills assessment and training with children and adolescents, Social validation and generalization of skills training.

Carol V. Harris, Ph.D. (U. Fla.). Child and adolescent behavior therapy, adolescent substance abuse, pediatric behavioral medicine.

Tamara S. Hoier, Ph.D. (WVU). Treatment of sexually abused children and adolescents; treatment of substance abusers.

Kevin Larkin, Ph.D. (U. Pitt). Behavioral assessment and treatment of anxiety-related disorders, Relationship between cardiovascular reactivity and cardiovascular disease.

Vernon Odom, Ph.D. (U. N.C.). Abnormal and normal visual development.

Miranda Pratt, Ph.D. (U. Iowa). Psychophysiology of emotions, development and treatment of sexual dysfunction.

James M. Puckett, Ph.D. (U. Mo.). Aging, Cognition, Psychophysiology.

Public Administration

Professors

Gerald M. Pops, J.D. (U. Calif.). Personnel, Public law.

David G. Williams, Ph.D. (SUNY Albany)—Chairperson. Public organization, Management.

Associate Professors

Harvey J. Wolf, D.P.A. (USC). Research, Organizational behavior.

Assistant Professor

Kenneth A. Klase,* D.P.A. (U. Ga.). Public budgeting and finance, Public policy analysis.

Jin W. Mok, Ph.D. (WVU). Public policy, Methodology, Comparative public administration.

*Associate Member

Religious Studies

Professor

Manfred O. Meitzen, Ph.D. (Harvard U.) Chairperson. Contemporary theology, New Testament studies, Ethics.

Associate Professor

Alan W. Jenks,* Th.D. (Harvard U.). Old Testament language and literature, Middle Eastern studies.

Sociology and Anthropology

Professors

Ronald C. Althouse, Ph.D. (U. Minn.). Chairperson. Sociology. Theory, Work, Occupational safety and health.

Richard A. Ball, Ph.D. (Ohio St. U.). Sociology. Deviant behavior, Criminology, Social psychology.

Arnold J. Levine,* Ph.D. (Columbia U.). Sociology. Health and illness, Urban, ESOP.

Jerold M. Starr, Ph.D. (Brandeis U.). Sociology. Life course, social movements, Sociology of knowledge.

Associate Professors

G. David Curry, Ph.D. (U. Chi.). Crime and justice, Quantitative methods, Survey and evaluation research.

Robert D. Foss, Ph.D. (U. Nev.) Sociology. Social psychology, Data analysis, American family.

David S. Hall, Ph.D. (U. Ky.) Sociology. Medical, health care delivery.

Ann L. Paterson, Ph.D. (Mich. St. U.) Sociology. Chairperson. Education, Sex roles, Socialization.

Joseph J. Simoni,* Ph.D. (U. Notre Dame) Sociology. Community, Ethnic relations, Health communication.

Assistant Professor

Lawrence T. Nichols, Ph.D. (Boston C.) Sociology. Criminology, Social change, Theory.

Sally W. Maggard, Ph.D. (U. Ky.). Sociology. Appalachian studies, Gender, Work, Social change.

Kenyon R. Stebbins, Ph.D. (Mich. St. U.) Anthropology. Medical anthropology, Latin America, Political economy of history.

College of Business and Economics

Accounting

Professors

Jay H. Coats, Ph.D. (U. Pitt). Cost/managerial accounting, Microcomputers in accounting, Accounting education.

Robert S. Maust,* M.S. (WVU). CPA—Chairperson. Financial accounting, Accounting theory, Managerial and cost accounting.

Adolph Neidermeyer,* Ph.D. (U. Iowa). Federal and state income taxation, Estate planning, Financial accounting.

Gail A. Shaw,* Ph.D. (U. Mo.), CPA—Associate Dean. Financial accounting theory, Auditing, Business combinations.

G. Stevenson Smith, Ph.D. (U. Ark.), CPA, CMA, CCA. Not-for-profit and governmental accounting, Managerial and cost accounting.

Pierre L. Titard,* Ph.D. (LSU), CPA. Financial accounting, Managerial accounting, Accounting education.

Associate Professors

David B. Pariser,* Ph.D. (So. Ill.), CPA, CCA. Financial accounting, Governmental accounting, Public sector auditing.

Ann B. Pushkin,* Ph.D. (VPI&SU), CPA. Auditing, Accounting information systems, Microcomputer applications.

Assistant Professor

Karen A. Shastri,* M.B.A. (U. Pitt.), CPA. Managerial accounting, Auditing, Capital markets.

Economics

Professors

Donald R. Adams, Jr., Ph.D. (U. Penn). American economic history, European economic history.

Jagdeep Bhandari,* Ph.D. (SMU). International finance, International trade, Economic development.

Robert D. Britt,* Ph.D. (U. Colo.). Managerial economics, History of economic thought, Economic history.

*Associate Member

Ming-jeng Hwang, Ph.D. (Tex. A&M U.). General theory, Urban and regional economics, Mathematical economics.
Andrew W. Isserman, Ph.D. (U. Penn). Regional economics.
Kern O. Kymn, Ph.D. (U. Chicago). General theory, Mathematical economics, Econometrics.
Patrick C. Mann, Ph.D. (Ind. U.). Utility economics, Industrial organization.
Douglas Mitchell, Ph.D. (Princeton U.). Monetary theory, Macroeconomics theory.
William S. Reece, Ph.D. (Wash. U.)—Chairperson. Econometrics and public finance.
Tom S. Witt, Ph.D. (Wash. U.—St. Louis). Econometrics, Energy economics, Regional economics.

Associate Professors

Brian J. Cushing, Ph.D. (U. Md.). Urban and regional economics, Econometrics, Public finance.
Clifford B. Hawley, Ph.D. (Duke U.). Labor economics, Microeconomics theory, Econometrics.
Assistant Professors
William Trumbull,* Ph.D. (U. N.C.). Public finance, Law and economics, Applied microeconomics.
Howard J. Wall,* Ph.D. (SUNY—Buffalo). International trade and microeconomics.

Finance

Professors

Howard L. Brewer, Ph.D. (U. Iowa). Financial management, Portfolio applications.
William B. Riley, Ph.D. (U. Ark.)—Chairperson. Investments, Capital markets.

Associate Professors

Terry L. Rose, Ph.D. (U. Ill.). Insurance, Risk management.
Frederick C. Scherr, Ph.D. (U. Pitt). Corporate finance, Capital markets and institutions.
Paul J. Speaker, Ph.D. (Purdue U.). Financial institutions, Modeling, Uncertainty, Microeconomics.

Assistant Professor

Ashok Abbott,* Ph.D. (VPI&SU). Corporate restructuring, International finance.
K. Victor Chow,* (U. Ala.). Corporate finance, Portfolio management, Investments.
Karen C. Denning,* (U. Pitt). Corporate finance, Speculative markets (options, futures), Economic regulation.

Industrial and Labor Relations

Professors

Robert L. Decker,* Ph.D. (Carnegie-Mellon U.). Industrial psychology, EEO-affirmative action testing and validation interviewing.
Randy D. Elkin, Ph.D. (Iowa St. U.)—Chairperson. Collective bargaining, Arbitration, Healthcare bargaining.
Richard W. Humphreys,* Ph.D. (U. Wisc.). Labor-management cooperation, Benefits, Work measurement.
John Remington,* Ph.D. (U. Mich.). Labor studies, Collective bargaining, Arbitration.
Dietrich Schappauf, D.B.A. (U. Ky.). Organizational performance and development, Labor-management cooperation.

Associate Professors

John Grasso, Ph.D. (Ohio St. U.). Adjunct. Vocational education programs, Mine training and certification, Management information systems.
Wilbur J. Smith,* M.S. (U. Wisc.). Human resource economics, Employment and training programs, Labor force.
Owen A. Tapper,* M.S. (U. Wisc.). Trade unionism, Safety and health, Labor management cooperation.

Assistant Professor

Dianne A. Brown,* Ph.D. (Fla. St. U.). Adjunct. EEO, Affirmative action, Social justice, Labor relations, Human resources.

Management

Professors

Jack Fuller, Ph.D. (U. Ark.). Heuristic decision making, Production planning and control, Systems analysis and design.
Dietrich L. Schappauf, D.B.A. (U. Ky.). Organizational performance and development, Labor-management cooperation.

Associate Professors

John Harpell,* D.B.A. (Ga. St. U.). Operations research, Mentorship, Production management.
Michael Lane, D.B.A. (Memphis St. U.). Business policy, Strategic planning, Small business planning.

*Associate Member

Ali Mansour, Ph.D. (U. Ga.)—Chairperson. Management information systems, Production management, International business.

Assistant Professors

Shi-Chu Lin,* Ph.D. (U. Rochester). Production planning, Scheduling, Inventory control.

Cindy Martinec,* Ph.D. (SUNY—Buffalo). Strategy policy studies, Production operations.

Michael Wolfe,* Ph.D. (U. Tex.—Austin). Artificial intelligence, Expert systems, Database design.

Marketing

Professors

Cyril M. Logar,* D.B.A. (Kent St. U.)—Dean. Health care marketing, Strategic marketing planning, Marketing research.

Terry Wilson, Ph.D. (Mich. St. U.). Services marketing, Marketing planning.

Associate Professor

Robert Cook, D.B.A. (Kent St. U.). Sales management.

Assistant Professors

Paula F. Bone,* Ph.D. (U. S.C.). Consumer expectations and behavior.

Gordon McClung,* Ph.D. (U. Pitt). Consumer behavior and advertising, Marketing strategy and policy.

Thomas Ponzurick, D.B.A. (Memphis St. U.). Services marketing, Transportation, Health care and entertainment-related services.

College of Creative Arts

Art

Professors

Robert P. Anderson, M.F.A. (Alfred U.). Ceramics.

Urban Couch, M.F.A. (Cranbrook Acad. Art)—Director of Art Collections. Painting.

Eve Faulkes,* M.F.A. (R.I. Sc. Design). Graphic design.

Ben F. Freedman, M.A. (U. Ariz.). Painting, Drawing.

Clifford A. Harvey, B.F.A. (Mpls. C. Art & Des.). Graphic design.

Margaret O. Lucas,* D.Ed. (Penn St. U.)—Dean. Art education.

Margaret T. Rajam, Ph.D. (U. Mich.). Art history.

Associate Professors

Carmon Colangelo, M.F.A. (LSU). Printmaking.

Victoria Fergus, Ph.D. (Purdue U.). Art education.

Alison Helm, M.F.A. (Syracuse U.). Sculpture.

John B. Schultz, Ph.D. (U. Pitt)—Chairperson. Art history.

William J. Thomas, Ph.D. (Penn St. U.). Art education.

Assistant Professor

Paul Krainak, M.F.A. (N. Ill. U.). Painting.

Music

Professors

Peter Amstutz, D.M.A. (Peabody Conserv.). Piano.

John Beall, Ph.D. (Eastman Sch. of Mus.). Composition, Theory.

Thomas S. Brown, Ph.D. (Northwestern U.)—Coordinator, Music Education. Music education, Vocal music, Appalachian music.

Philip J. Faini, M.M. (WVU). Percussion, African music.

Herman Godes, M.M. (Latvian St. Mus. Acad.). Piano.

William P. Haller, D.M.A. (N. Tex. St. U.). F.A.G.O. Organ, Theory.

Barton Hudson, Ph.D. (Ind. U.)—Director of Graduate Studies. Musicology, Renaissance music, Harpsichord.

Gerald Lefkoff, Ph.D. (Cath. U. Am.)—Coordinator, Theory-Composition. Theory, Electronic music, Viola.

James E. Miltenberger, D.M.A. (Eastman Sch. of Mus.)—Coordinator, Keyboard Instruments. Piano, Piano repertoire, Jazz.

Augusto Paglialunga, M.M. (New England Conserv.). Artist-in-Residence. Voice.

Richard E. Powell, M.Ed. (S.W. Tex. St. C.)—Coordinator, Brass-Percussion Instruments. Low brass instruments, Pedagogy.

William Skidmore, M.M. (U. Ill.)—Coordinator, Stringed Instruments.

William Taylor, M.M. (Ind. U.)—Coordinator, Voice-Opera. Voice.

*Associate Member

Gilbert Tryhall, D.M.A. (Cornell U.). Composition, Electronic music, Theory.
Don G. Wilcox, M.A. (Cal. St. C.—L. Bch.)—Director of Bands, Conducting.
Cecil B. Wilson, Ph.D. (Case West. Res. U.)—Chairperson, Musicology, 19th century music, Orchestration.

Associate Professors

Joyce Catalfano,* M.M. (Ithaca C.)—Coordinator, Woodwind Instruments, Flute.
Christine B. Kefferstan,* D.M.A. (U. Cincinnati). Piano, Group piano.
Janis-Rozena Peri,* M.M. (Miami U.). Voice, Vocal diction.
John F. Weigand,* D.M.A. (Fla. St. U.)—Coordinator, Undergraduate Admissions, Clarinet, Chamber music.
Christopher Wilkinson, Ph.D. (Rutgers U.)—Coordinator, Music History-Literature, Musicology, Baroque music, 20th century music.

Assistant Professors

Barbara Coeyman, Ph.D. (CUNY). Musicology, Baroque music, Collegium musicum.
John E. Crotty,* Ph.D. (Eastman Sch. of Mus.). Theory, Analysis, Composition.
Robert H. Thieme, Jr., M.M. (WVU)—Director, WVU Opera Theatre, Opera, Vocal repertoire, Accompanying-coaching.
John R. Winkler,* M.M. (Northwestern U.). Trumpet, Theory, Chamber music.

Theatre

Professors

Frank Gagliano, M.F.A. (Columbia U.)—Claude Worthington Benedum Professor, Playwriting.
Charles D. Neel, Ph.D. (Cornell U.). Musical theatre.
Joann Spencer Siegrist, M.F.A. (U. Ga.). Puppetry, Creative drama.
John C. Whitty, Ph.D. (U. Iowa). Theatre history.
William J. Winsor, M.F.A. (Ohio St. U.). Theatre design.

Associate Professors

W. James Brown, M.F.A. (U. Wash.)—Chairperson, Theatre design.
Michelle Guillot, M.F.A. (Yale Sch. Drama). Theatre design.
Edward T. Herendeen,* M.F.A. (Ohio U.). Acting.
Joseph Olivieri, M.F.A. (Actor's Conserv. Theat.). Acting.

Assistant Professors

Jack P. Held, M.A. (UCLA). Stage speech.
Victor G. McQuiston, M.F.A. (Ohio St. U.). Technical direction.
Linda D. Milian,* M.F.A. (Rutgers U.). Costuming.
Sara Romersberger, M.A. (U. Ill.). Movement.
Michael A. Tortora, M.F.A. (Wayne St. U.). Lighting design.

School of Dentistry

Professors

Henry J. Bianco,* D.D.S. (U. Md.)—Chairperson, Prosthodontics, Patient management and treatment.
W. Robert Biddington,* D.D.S. (U. Md.)—Dean, Endodontics, Educational administration.
Jerry E. Bouquot, D.D.S. (U. Minn.)—Chairperson, Oral pathology, Tumor epidemiology.
Richard J. Crout, D.D.S. (U. Pitt). Periodontics, Drug therapy and pharmacology.
Christina B. DeBiase, Ed.D. (WVU). Dental hygiene, Educational administration.
Sanford J. Fenton, D.D.S. (NYU)—Chairperson, Pedodontics, Management of disabled patient.
William L. Graham,* D.D.S. (U. Md.)—Chairperson, Oral diagnosis and radiology, Information systems.
Catherine E. Graves,* M.A. (WVU). Dental hygiene, Computer application.
Robert W. Graves,* D.D.S. (WVU)—Chairperson, Oral and maxillofacial surgery, Pharmacy, Drug therapy and pharmacology.
Gordon G. Keyes, D.D.S. (U. Md.). Oral pathology, Legal aspects.
Barbara K. Komives,* M.S. (Ohio St. U.)—Chairperson, Dental hygiene, Educational administration.
Harry L. Legan, D.D.S. (U. Minn.)—Chairperson, Orthodontics, Dental facial orthopedics.
William R. McCutcheon,* D.D.S. (WVU)—Chairperson, Dental public health, Behavioral dentistry.
James E. Overberger, D.D.S. (U. Pitt). Materials science, Prosthodontics.
Robert G. Pifer,* D.D.S. (WVU). Oral radiology, Treatment planning.

*Associate Member

Arthur E. Skidmore, D.D.S. (WVU)—Chairperson. Endodontics, Pulpal anatomy.
John T. Welch,* D.D.S. (U. Md.)—Chairperson. Hospital dentistry, Hospital protocol and evaluation.

Associate Professors

Robert H. Hornbrook,* D.D.S. (WVU). Periodontics, Treatment therapy.
Marcia A. Gladwin, M.S. (U. Ky.). Dental hygiene, Dental materials.
Richard Ted Rice, D.D.S. (U. Iowa). Endodontics, Biocompatibility.
Norton P. Smith II,* D.D.S. (WVU). Fixed prosthodontics, Computers.
Carol A. Spear, M.S. (U. Mich.). Dental hygiene, Educational administration.
Robert N. Stuchell, D.D.S. (U. Pitt). Preventive dentistry, Treatment therapy.

Assistant Professor

Gene L. Dickinson, D.D.S. (U. Tenn.). Dental materials, Evaluation of materials.
Andrea P. Mueller,* M.S. (WVU). Dental hygiene, Educational administration.
Rajiv Paonaskar,* D.D.S. (WVU). Orthodontics, Dental facial orthopedics
Julie Ann Staggers,* D.D.S. (WVU). Orthodontics, Dental facial orthopedics.

College of Engineering

Chemical Engineering

Professors

Richard C. Bailie, Ph.D. (U. Iowa). Biomass pyrolysis, Fluidization, Thermal processes.
Eugene V. Cilento, Ph.D. (U. Cincinnati)—Chairperson. Physiological transport phenomena, Biomedical engineering, Image analysis and mathematical modeling.
Dady B. Dadyburjor, Ph.D. (U. Del.). Catalysis, Reaction engineering, Micellization.
Hisashi O. Kono, Dr. Engr. (Kyushu U.). Fluidization, Powder technology, Reaction engineering.

Associate Professors

Joseph A. Shaeiwitz, Ph.D. (Carnegie-Mellon U.). Biochemical separations, Interfacial phenomena, Mass transfer.
Alfred H. Stiller, Ph.D. (U. Cincinnati). Chemistry (physical/inorganic chemistry), Solution chemistry, Coal liquefaction.
Wallace B. Whiting, Ph.D. (U. Calif.—Berkeley). Thermodynamics, Fluid-phase equilibria, Chemical process design.
Ray Y. K. Yang, Ph.D. (Princeton U.). Chemical reaction engineering, Biochemical engineering, Coal gasification, Plant cell culture, Modeling and simulation.
John W. Zondlo, Ph.D. (Carnegie-Mellon U.). Heat transfer, Coal enhancement and utilization.

Assistant Professor

Richard Turton, Ph.D. (Ore. St. U.). Fluidization, Heat transfer, Reaction kinetics, Chemical process design.

Civil Engineering

Professors

Ronald W. Eck, Ph.D. (Clemson U.). Transportation engineering, Traffic, Highways.
W. Joseph Head, Ph.D. (Purdue U.). Waste utilization, Highway and airfield pavements, Concrete.
GangaRao V. S. Hota, Ph.D. (N.C. St. U.). Mathematical modeling of engineering systems, Bridge engineering, Prefabricated housing.
Sammy A. Kiger, Ph.D. (U. Ill.)—Chairperson. Structural dynamics, Blast effects.
Larry D. Luttrell, Ph.D. (Cornell U.). Analysis and design of structures/steel, composite slabs, Metal buildings, Case studies of failures.
Lyle K. Moulton, Ph.D. (WVU). Soil properties and behavior, Groundwater and seepage, Foundation engineering.
Edward S. Neumann, Ph.D. (Northwestern U.). Transportation engineering and planning, Automated people movers.
William A. Sack, Ph.D. (Mich. St. U.). Physical, chemical, biological waste treatment, Industrial waste processing, recovery.

Associate Professors

Darrell R. Dean, Jr., Ph.D. (Purdue U.). Land surveying, Mapping, Photogrammetry.
Robert N. Eli, Ph.D. (U. Iowa). Hydrology, Hydraulics, Computer graphics.
James S. Gidley, Ph.D. (Harvard U.). Water resources planning, Solid and hazardous wastes, Water and sewer systems.
Donald D. Gray, Ph.D. (Purdue U.). Fluid flow, Computational fluid mechanics.

*Associate Member

H. Jayalath Siriwardane, Ph.D. (VPI&SU). Geotechnical engineering/geomechanics, Finite element method, Computer applications.

Constantine C. Spyros, Ph.D. (U. Minn.). Dynamics of structures, Soil-structure interaction, Numerical methods of analysis (BEM, FEM).

Assistant Professors

John J. Bowders, Jr., Ph.D. (U. Tex.). Geotechnical engineering, Environmental geotechnology.

H. C. Chen, Ph.D. (Northwestern U.). Experimental stress analysis, Concrete member behavior.

Julio F. Davalos, Ph.D. (VPI). Finite element analysis of structural systems, Composite materials.

Electrical and Computer Engineering

Professors

Wils L. Cooley, Ph.D. (Carnegie-Mellon U.). Biomedical engineering, Instrumentation, Coal mine power systems, Electrical safety, Grounding and ground beds.

Ronald L. Klein, Ph.D. (U. Iowa)—Chairperson. Automatic control, Stochastic control, Estimation theory and applications, Linear system theory, System identification.

Roy S. Nutter, Jr., Ph.D. (WVU). Neural networks and artificial intelligence, Microprocessor-based environmental monitoring systems, Microprocessor control of energy management, Computer architecture, Digital systems communications.

Craig S. Sims, Ph.D. (SMU). Signal processing, Estimation theory, Control systems, System identification, Stochastic control, Seismic applications of signal processing and estimation theory.

Robert E. Swartwout, Ph.D. (U. Ill.). Digital electronic and computer systems, Computer arithmetic circuits, Multivalued (non-binary) logic systems, Minicomputer and microprocessor applications.

Associate Professors

Mohammad A. Choudhry, Ph.D. (Purdue U.). Power system control and analog simulation, DC transmission, Dynamic and transient stability studies, Estimation and parameter identification.

Ali Feliachi, Ph.D. (Ga. Tech.). Control systems theory, Time-delay systems, Large-scale systems, Adaptive control, Power systems dynamics and digital simulation.

Kaveh Heidary, Ph.D. (Syracuse U.). Analytical and numerical electromagnetics, EM scattering and propagation, Antenna and microwave engineering.

Mark A. Jerabek, Ph.D. (Purdue U.). Acoustics waves in solids, Signal processing of acoustic waves, Ultrasonic imaging (tomography), Electromagnetics, Digital signal processing.

Joseph Joseph, Ph.D. (Indian Inst. of Sci.). Artificial intelligence and its application to medical diagnosis, Computer architecture, Data flow systems, Petri nets.

Powsiri Klinkhachorn, Ph.D. (WVU). Mini/micro computer-based applications, Computer hardware/software development, Computer architecture, Binary and non-binary logic systems.

Robert L. McConnell, Ph.D. (U. Ky.). Linear and digital electronic circuits and systems, Electronic instrumentation and applications, Power measurement and control for transportation systems.

Assistant Professors

Charles J. Alajajian, Ph.D. (U. Ill.). Computational methods for the analysis and design of electronic circuits, Passive/active filter design, Digital signal processing.

Alok Kumar, Ph.D. (U. Leeds). Computer-aided control system analysis and design, Large-scale systems, Stochastic control, Estimation theory and applications, Two-dimensional digital signal processing.

Nigel T. Middleton, Ph.D. (U. Witwatersrand, S. Africa). Dynamic system simulation, Automatic and stochastic control theory and applications, Industrial process control, Energy management systems.

Afzel Noore, Ph.D. (WVU). Fault tolerant memory design, Faulty diagnosis of computers, Reduced order logic testing, Faculty location, VLSI design.

Industrial Engineering

Professors

Jack Byrd, Jr., Ph.D. (WVU). Operations research, Production systems, Entrepreneurial studies.

Robert C. Creese, Ph.D. (Penn St. U.). Manufacturing processes systems, Foundry engineering, Cost engineering.

Wafik H. Iskander, Ph.D. (Tex. Tech U.). Operations research, Simulation, Applied statistics.

L. Ted Moore, Ph.D. (Rice U.). Operations research, Linear programming, Production/operations management.

Ralph W. Plummer, Ph.D. (WVU)—Chairperson. Human factors, System safety, Industrial hygiene.

*Associate Member

Terrence J. Stobbe, Ph.D. (U. Mich.). Ergonomics, System safety, Industrial hygiene.
Curtis J. Tompkins, Ph.D. (Ga. Tech)—Dean. Operations management, Statistical models, Strategic planning.

Associate Professors

Rashpal S. Ahluwalia, Ph.D. (U. W. Ontario). Automation, CAD/CAM, Robotics.
Majid Jaraiedi, Ph.D. (U. Mich.). Quality control and applied statistics, Information system.

Assistant Professors

B. Gopalakrishnan,* Ph.D. (VPI). Manufacturing.
Warren R. Myers, Ph.D. (WVU). Ergonomics, Industrial hygiene and Safety engineering.

Mechanical and Aerospace Engineering

Professors

Richard A. Bajura, P.E., Ph.D. (U. N. Dame). Fluids engineering.
Suren N. Dwivedi, Ph.D. (Birla Inst., India). Manufacturing engineering.
Rory Flemmer, Ph.D. (U. Natal, S. Africa)—Research. Fluidization, Machine vision.
Eric K. Johnson, P.E., Ph.D. (U. Wisc.). Heat transfer, Combustion, Thermodynamics, Gas-solid flows.
John T. Jurewicz, Ph.D. (Wash. St. U.)—Associate Dean. Experimental fluid mechanics, Gas-solid flows.
John Kuhlman, Ph.D. (Case West. Res. U.). Fluid mechanics.
Thomas R. Long, Ed.D. (WVU)—Associate Dean. Engineering design.
John L. Loth, P.E., Ph.D. (U. Toronto). Aerospace systems, Combustion.
Donald W. Lyons, Ph.D. (Ga. Tech.)—Chairperson. Manufacturing systems engineering, Instrumentation.
Rajendra Sharan, Ph.D. (U. Roorkee, India)—Visiting. Metal working, Materials.
John E. Sneedenberger, P.E., Ph.D. (WVU). Mechanical design and automation.
Emil J. Steinhardt, P.E., Ph.D. (U. Pitt). Engineering systems design, Energy management.
Prakash Upadhyay, Ph.D. (Indian Inst. Tech.)—Visiting. Mechanics, Materials.

Associate Professors

Ismail Celik, Ph.D. (U. Iowa). Fluids engineering.
Nigel Clark, Ph.D. (U. Natal, S. Africa). Fluidized bed combustion, Particle dynamics.
Russell K. Dean, Ph.D. (WVU)—Assistant Provost. Engineering mechanics.
Alvin Howell, Ph.D. Visiting. Structures, Materials.
Kenneth H. Means, P.E., Ph.D. (WVU). Kinematics, Dynamics, Stability, Friction and wear.
G. Michael Palmer, Ph.D. (WVU). Instrumentation, Microprocessor applications.
Jacky Prucz, Ph.D. (Ga. Tech.). Structural dynamics, Composite materials, Experimental mechanics.
Nithiam T. Sivaneri, Ph.D. (Stanford U.)—Graduate Program Director. Numerical methods (FEM, BEM), Aeroelasticity, Fracture mechanics, Structural dynamics, Composite materials.
Charles Stanley, P.E., Ph.D. (WVU). Bioengineering, Microprocessor applications.
James E. Smith, Ph.D. (WVU). Mechanical design.
Wallace S. Venable, P.E., Ed.D. (WVU). Engineering mechanics.

Assistant Professors

Larry Banta, Ph.D. (Ga. Tech.). Robotics, Automation.
Ever Barbero, Ph.D. (VPI&SU). Engineering mechanics, Composite materials.
Mridul Gautam, Ph.D. (WVU)—Research. Fluid mechanics.
Bruce Kang, Ph.D. (U. Wash.). Experimental mechanics.
Margaret Lyell, Ph.D. (U. So. Calif.). Fluid mechanics.
Gary Morris, Ph.D. (WVU). Experimental fluid mechanics, Aerodynamics.
Victor Mucino, D.E. (U. Wisc.—Mil.). Engineering design, Solid mechanics.
Timothy Norman, Ph.D. (Purdue). Composite materials, Fracture mechanics, Experimental mechanics, Biomechanics.
Mehrdad Shahnam, Ph.D. (WVU)—Research. Fluid mechanics.

Genetics and Developmental Biology

Professors

David F. Blaydes, Ph.D. (Ind. U.). Plant genetics, Plant physiology, Cytokinins.
Donald F. Butcher,* Ph.D. (Iowa St. U.). Population genetics.
Roy L. Butcher, Ph.D. (Iowa St. U.). Reproductive physiology.
Linda Butler, Ph.D. (U. Ga.). Entomology, Forest entomology, Pest management.
Bruce Caterson, Ph.D. (Monash U., Australia). Proteoglycan structure and regulation.
Nyles Charon, Ph.D. (U. Minn.). Medical bacteriology, Genetics and physiology of spirochetes.

*Associate Member

John E. Hall,* Ph.D. (Purdue U.). Parasitology, Bacterial endosymbionts.
Walter J. Kaczymarczyk,* Ph.D. (Hahnemann Med. C.). Biochemical genetics, Biochemistry.
Edward C. Keller, Ph.D. (Penn St. U.). Ecological genetics, Population genetics.
Michael R. Miller, Ph.D. (Penn St. U.). DNA metabolism.
Joginder Nath, Ph.D. (U. Wisc.)—Chairperson. Cytogenetics, Evolution, Mutagenetics.
Tong-man Ong, Ph.D. (Ill. St. U.)—Adjunct. Mutagenesis toxicology.
Robert S. Pore, Ph.D. (U. Calif.). Mycology, Pathobiology, Mycoses.
Dennis C. Quinlan, Ph.D. (U. Rochester). Cellular/molecular biology, Cell membranes, Cancer biology.
William V. Thayne, Ph.D. (U. Ill.). Statistics, Statistical genetics.
George V. Tryfates, Ph.D. (Rutgers U.). Nutritional oncology. Valentin Ulrich, Ph.D. (Rutgers U.). Biochemical genetics, Plant breeding.
Valentin Ulrich,* Ph.D. (Rutgers U.). Biochemical genetics, Plant breeding.
Knox Van Dyke, Ph.D. (St. Louis U.). Chemiluminescence in human cells, Effects of antiinflammatory drugs on chemiluminescence.
Stanley Wearden, Ph.D. (Cornell U.). Biometrics, Statistical genetics, Population biology.

Associate Professors

Vincent F. Gerencser, Ph.D. (U. Ky.). Dental microbiology, Haemagglutinin of *Bacteroides* species.
James B. McGraw, Ph.D. (Duke U.). Plant ecology/genetics, Plant physiology.
Henry F. Mengoli, Ph.D. (Cath. U. Am.). Medical bacteriology, Bacterial Fc receptors, Intestinal colonization.
Ethel C. Montiegel,* M.S. (WVU). Developmental biology.
Dennis O. Overman, Ph.D. (U. Mich.). Teratology, Organ culture.
Jeanine Strobl, Ph.D. (Geo. Wash. U.). Estrogen receptor mechanisms.
Leah A. Williams, Ph.D. (WVU). Developmental biology, Vertebrate anatomy, Lens regeneration.
David B. Yelton, Ph.D. (U. Mass.). Microbial genetics, Bacteriophage, Molecular genetics.

Assistant Professors

John Baker, M.D. (WVU). Human/medical molecular genetics.
Patricia E. Gallagher, Ph.D. (U. Tenn.). Cellular/molecular biology.
Keith Garbutt, Ph.D. (U. Wales). Population genetics.
Karen S. Katula, Ph.D. (Northwestern U.). Cellular/molecular biology, Molecular genetics.
Hillar Klandorf, Ph.D. (U. Edinburgh). Endocrinology.
Michael Kotarski, Ph.D. (Cornell U.). Cellular/molecular biology.
Deborah Leonard, Ph.D. (Cornell U.). Cellular/molecular biology.
James Scheil, Ph.D. (U. Ky.). Immunology, Mechanism of cytotoxic T lymphocyte-mediated antigen recognition and effector function.
Eugene K. Vrana, Ph.D. (LSU). Nueromolecular biology.

College of Human Resources and Education

Clinical and Counseling Division

Counseling Psychology and Rehabilitation

Professors

L. Sherilyn Cormier, Ph.D. (Purdue U.)—Counseling Psychology. Counseling psychology training and clinical supervision models. Advanced psychotherapeutic techniques.
William H. Cormier, Ed.D. (U. Tenn)—Counseling Psychology. Director, Counseling Psychology Training Program. Counseling psychology research. Assessment of dysfunctional couples and families. Cognitive-behavioral therapy.
James DeLo,* Ph.D. (U. Pitt)—Counseling. Multi-cultural transaction, Biofeedback. Coordinator, Shepherdstown Master's Degree Program.
Ranjit K. Majumder, Ph.D. (U. Okla.)—Rehabilitation. Psychology, Rehabilitation.
Robert P. Marinelli, Ed.D. (Penn St. U.)—Coordinator, Master's Degree Program. Rehabilitation counseling and psychology, vocational counseling and psychology, mental health counseling.
Robert L. Masson, Ed.D. (SUNY)—Rehabilitation. Group counseling.
Jeffrey K. Messing,* Ed.D. (Syracuse U.)—Division Director, Counseling Psychology Chairperson. Vocational psychology, Consulting models, Program design, Conflict resolution and mediation.
Joseph B. Moriarty, Ph.D. (Fordham U.)—Rehabilitation. Psychology, Rehabilitation.
David J. Srebalus, Ed.D. (Ind. U.)—Counseling Psychology. Vocational psychology, career counseling, counseling and psychotherapy theories.

*Associate Member

Roy H. Tunick, Ed.D. (W. N. Colo. U.)—RehabilitPh.D. (Ohio St. U.)—Counseling. Child play therapy, Handicapped children, Vocational development.

Michael T. Yura, Ph.D. (Ohio St. U.)—Counseling. Child play therapy, Handicapped children, Vocational development.

Associate Professors

Kathryn B. Greever,* Ed.D. (WVU)—Rehabilitation. Grant development.

Edward E. Jacobs, Ph.D. (Fla. St. U.)—Counseling. Group counseling, Marriage and family.

Speech Pathology and Audiology

Professors

Carolyn P. Atkins, Ed.D. (WVU)—Speech Pathology. Speech improvement, Clinical supervision.

Mary Ellen Tekeli Koay, Ph.D. (U. Okla.)—Speech Pathology. Cleft palate, Neurophysiology, Neuropathologies.

Norman J. Lass, Ph.D. (Purdue U.)—Speech Pathology. Speech perception, Speech acoustics.

Dennis M. Ruscello, Ph.D. (U. Ariz.)—Chairperson, Speech Pathology. Language, Articulation, Clinical supervision.

Kenneth O. St.Louis, (U. Minn.)—Speech Pathology. Fluency, Voice, Clinical supervision.

Charles M. Woodford, Ph.D. (Syracuse U.)—Audiology. Audiological evaluation, Industrial and environmental audiology, Clinical supervision.

Assistant Professors

Conrad Lundein, Ph.D. (U. Iowa)—Audiology. Aural rehabilitation, Central auditory disorders, Clinical supervision.

Linda I. Shuster, Ph.D. (Ohio St. U.)—Speech Pathology. Aphasia, Language, Clinical supervision.

Special Education

Professors

Thomas P. Lombardi, Ed.D. (U. Ariz.)—Learning disabilities, Mental retardation.

Victor S. Lombardo, Ed.D. (U. Missouri)—UWV COGS.

Gabriel A. Nardi, Ph.D. (U. Wisc.)—Behavioral disorders, Mental retardation.

Wilfred D. Wienke, Ed.D. (U. No. Colo.)—Chairperson. Professional development, Mental retardation.

Associate Professors

Edmund J. Coombe,* Ed.D. (Temple U.)—Mental retardation, Gifted education, Special education administration.

Barbara L. Ludlow, Ed.D. (WVU)—Severe/profound handicaps, Early intervention, Clinical supervision.

Diane T. Woodrum, Ed.D. (WVU)—Mental retardation, Behavioral disorders, Learning disabilities.

Assistant Professors

Jane E. Doherty,* Ph.D. (Purdue)—Early intervention, Severe/profound handicaps, Mental retardation.

Wendy R. Heitzenroder,* Ed.D. (WVU)—Clinical. Behavior disorders, Learning disabilities.

Joyce A. Meikamp,* Ed.D. (Ball State U.)—Clinical, Learning disabilities, Mental retardation.

Luise B. Savage,* Ed.D. (WVU)—Clinical. Gifted education, Clinical supervision.

Ronald K. Wolf,* Ph.D. (U. Kan.)—Research. Learning disabilities, Administration.

Division of Education

Curriculum and Instruction

Professors

John L. Carline,* Ph.D. (Syracuse U.)—Curriculum, Teacher behavior, Interpersonal relations.

Boyd D. Holtan, Ed.D. (U. Ill.)—Mathematics education, Instructional strategies, Microcomputer education.

Ronald V. Iannone, Ed.D. (Syracuse U.)—Creative drama, Aesthetic education, Alternative education.

Roy A. Moxley, Ph.D. (U. Mich.)—Early childhood education, Early literacy, Educational technology.

C. Kenneth Murray,* Ph.D. (Ohio St. U.)—Division Director. Social studies education, Economic education, Teacher behavior.

Patricia A. Obenauf, Ed.D. (U. Va.)—Curriculum development, Science education, Conceptual models.

Clyde W. Sawyer, Jr., Ph.D. (U. N.C.)—UWV COGS.

Patricia K. Smith, Ed.D. (WVU)—Recreational/clinical reading, Language arts.

*Associate Member

Associate Professors

W. Scott Bower, Ph.D. (Ohio St. U.). Teaching strategies, Curriculum development, Teacher effectiveness.

Ardeth M. Deay, Ph.D. (Cornell U.). Classroom organization/management, Rural women in education, Peace education.

Sandra Bradford DeCosta, Ed.D. (WVU). Early childhood education, General methods of education, Multicultural/global education.

Mary E. Haas, Ed.D. (Indiana U.). Social studies education, Geographic education, Global education.

Perry D. Phillips, Ed.D. (WVU)—Associate Dean. Social studies education, Teacher education.

W. Michael Reed, Ed.D. (VPI&SU)—Coordinator, *Microcomputer Lab and Interim Chairperson*. Microcomputer education, English education, Cognition and writing.

Martin Saltz, Ph.D. (U. Conn.). Developmental/Corrective reading, Computer applications in language arts.

Assistant Professors

Mary A. Barksdale, Ed.D. (VPI&SU). Reading education, Reading anxiety, Cognition.

Jeanne Gerlach, Ed.D. (WVU). English education, Writing as learning, Collaborative writing.

Betsy M. Hobbs,* Ed.D. (WVU). Content area reading, Reading motivation-children's literature, Experimental programs for adults.

Nancy Hoffman, Ed.D. (Penn St. U.). Supervision, Staff development, Effective teaching.

Steven D. Rinehart, Ed.D. (WVU). Reading education, Language arts, Teacher education.

Karen F. Thomas, Ph.D. (U. Pitt). Language/literacy education, Reading, Language arts.

Jody Wolfe, Ed.D. (WVU).—Research. Social studies education, Curriculum, Teacher thinking, Teacher education.

Education Administration

Professors

John O. Andes, Ed.D. (U. Fla.)—Coordinator. Higher education law, Administration and leadership.

Ronald Childress, Ed.D. (U. Tenn.)—Dean, UWV COGS. Instructional management.

Meredith Freeman,* Ph.D. (U. Mo.). WV COGS. Instructional management

Neil L. Gibbins, Ph.D. (Ohio St. U.)—Marshall U. Staff personnel, School plant, Public school law.

Harold I. Goodwin,* Ph.D. (U. Calif.). Personnel, Collective bargaining, Complex organizations.

Richard A. Hartnett, Ed.D. (WVU)—Chairperson. Comparative higher education, Administrative theory, Academic governance, Collective bargaining.

Robert B. Hayes,* Ed.D. (U. Kans.)—Marshall U. Higher education administration, finance and issues, Leadership.

Paul A. Leary, Ph.D. (U. Mass.)—UWV COGS. Public school administration.

H. Edward Lilley, Ph.D. (Tex. A&M). Educational facilities, School-community relations, Principalship.

James A. Martin, Ed.D. (U. Tenn.). Superintendency, Business management, School law.

Richard F. Meckley, Ph.D. (Ohio St. U.). Education and finance, School business administration.

William G. Monahan, Ed.D. (Mich. St. U.). Administrative theory, Higher education issues.

Caroline Neal, Ed.D. (WVU)—UWV COGS. Social foundations, Public school administration.

Ermel Stepp, Ed.D. (WVU)—Marshall U. Administrative theory, Leadership, Computers.

Powell E. Toth, Ph.D. (Ohio St. U.)—UWV COGS. Public school administration.

Carole A. Vickers, Ph.D. (Ohio St. U.)—Marshall U. Home economics.

Ken M. Young, Ed.D. (VPI&SU)—UWV COGS. School principalship, Public school administration.

Associate Professors

Robert Bickel, Ph.D. (Fla. St. U.)—Marshall U. Educational foundations.

Ernest R. Goeres, Ph.D. (U. Iowa)—Associate Dean. Higher education finance, College business management, Economics of higher education.

Billy K. Gordon,* Ed.D. (U. Ky.)—Marshall U. Supervision, General school administration.

JoAnn Hall,* Ed.D. (VPI&SU)—UWV COGS. Supervision, Public school administration.

Helen M. Hazi, Ph.D. (U. Pitt). Legal issues impacting instructional supervision.

Richard Hunt,* Ph.D. (Ohio St. U.)—UWV COGS. Public school administration.

Edwin R. Smith, Ed.D. (WVU). Planning, Institutional research.

Linda Spatig, Ed.D. (U. Houston)—Marshall U. Education foundations.

*Associate Member

Michael Sullivan,* Ed.D. (WVU)—UWV COGS. Organization and administration.
Jack E. Yeager, Ed.D. (VPI&SU)—UWV COGS. Higher education law, Politics of education, Public school administration.

Assistant Professors

Nell C. Bailey,* Ed.D. (Ind. U.)—Dean of Student Affairs, Marshall U. Personnel administration, Higher education.
Thomas S. Sloane,* Ph.D. (Ohio St. U.)—Adjunct. Assistant Dean, Student Life. College student, Student development.
F. David Wilkin, Ed.D. (Harvard)—Marshall U. Higher education administration.

Foundations Division

Education Foundations

Associate Professor

Christine M. Shea, Ph.D. (U. Ill.). History of education and American education, Political economy and social foundations of education.

Assistant Professor

Scott H. Bilow, Ph.D. (Cornell). Philosophy of education, Ethics and educational policy.

Educational Psychology

Professors

Benjamin H. Bailey, Ed.D. (U. Fla.). Educational psychology, research, measurement, and evaluation.

Sheldon R. Baker, Ed.D. (Case West. Res. U.). Educational psychology, Psychological testing, Research and statistical methodology.

Lawrence Fraley, Jr., Ed.D. (USC). Conceptual foundations of behaviorology, The science of human behavior applied to instructional development and teaching.

Daniel E. Hursh, Ph.D. (U. Kans.). Developmental and child psychology, Instructional and environmental design, Language development.

Rogers McAvoy, Ph.D. (Ind. U.). Education, Learning, Instruction.

Anne H. Nardi, Ph.D. (WVU)—Division Director and Chairperson. Developmental psychology, Problem solving, Adult learning.

John J. Paterson,* Ed.D. (Mich. St. U.)—Program Coordinator. Administrative and educational services, Educational statistics and measurement.

Diane L. Reinhard, Ph.D. (Ohio St. U.)—Dean. Educational evaluation, Elementary education, Educational research, statistics, and measurement.

Meng Shu Tseng, Ed.D. (Ind. U.). Vocational education, Multivariate statistics, Research methodology.

Ernest A. Vargas, Ph.D. (U. Pitt). Behaviorology, Instructional design, Verbal behavior.

Julie S. Vargas, Ph.D. (Penn St. U.). Instructional design, Behavioral analysis, Microcomputers, Verbal behavior.

Richard T. Walls, Ph.D. (Penn St. U.). Educational psychology, Human learning, Problem solving, Vocational rehabilitation.

Associate Professor

Floyd L. Stead,* Ed.D. (WVU). Education, Educational measurement, evaluation, research.

Assistant Professors

Curtis J. Bonk, Ph.D. (U. Wisc.). Thinking skill research, Metacognition and social cognition within reading and writing, New technologies in education.

Technology Education

Professors

Paul W. DeVore, Ph.D. (Penn St. U.). Technology education, Technology and community development, Transportation systems.

David McCrory, Ph.D. (Case West. Res. U.)—Chairperson. Curriculum studies, Technology transfer, Professional development.

Edward Pytlik, Ph.D. (Iowa St. U.). Technology education, Production systems, International development.

Associate Professor

George Maughan, Ed.D. (WVU). Technology education, Communication and information systems.

*Associate Member

School of Journalism

Professors

John H. Boyer, Ph.D. (U. Mo.). Newspaper management, Media law, Women and media.
Charles F. Cremer, Ph.D. (U. Iowa). Broadcast journalism principles, Technologies and practices.
Robert M. Ours, Ph.D. (C. Wm. & Mary). Journalism history, Magazine and news and feature writing.
Emery L. Sasser, Ph.D. (U. Ill.). Dean. News writing, Public opinion.
William O. Seymour, M.A. (E. Tex. St. U.). Photojournalism.

Associate Professors

Richard A. Schreiber, Ph.D. (U. Mo.). Creative advertising, Communication theory.
Pamela D. Yagle,* M.S.J. (WVU). Reporting, Language skills, High school publications.

Assistant Professors

Patricia C. Findley,* M.A. (Calif. St. U.). Reporting, Editing, Production.
James C. Paty, M.A. (U. Ala.). News and feature writing, Production.
Ivan R. Pinnell, Ph.D. (U. Denver). Public relations.

Health Sciences Center Basic Sciences

Anatomy

Professors

William A. Beresford, D. Phil. (U. Oxford). Labeled lectins, Glycoproteins, Induced bone formation.
J. David Blaha, M.D. (U. Mich.). Orthopedics and tissue reactions to implants.
Patrick I. Brown, Ph.D. (S. Ill. U.)—Marshall U. Mammalian male reproduction and urinary morphology and histochemistry.
Eugene V. Cilento, Ph.D. (U. Cincinnati). Research. Quantitative *in vivo* microscopic studies of hepatic microcirculatory transport phenomena.
Bruce S. Chertow, M.D. (U. Ill.)—Marshall U. Subcellular mechanisms of insulin release, Retinoids and vitamin D interactions.
James L. Culberson, Ph.D. (Tulane U.). Comparative vertebrate neuroanatomy of mammalian somatosensory systems.
James D. Fix,* Ph.D. (Tubingen)—Marshall U. Neuropathology, Cytoarchitecture of CNS, Aging in CNS.
Ralph G. Kirk, Ph.D. (Yale U.). X-ray microanalysis.
Gregory W. Konat, Ph.D. (U. Odense). Molecular biology of myelinogenesis in the central nervous system.
Carlin A. Pinkstaff, Ph.D. (Emory U.). Histochemistry, especially comparative histology and histochemistry of salivary glands.
Frank D. Reilly, Ph.D. (U. Cincinnati). Neurohistochemical, biochemical, *in vivo*, and electron microscopic studies of mechanisms regulating hepatic or splenic blood flow and metabolism in conditions of health and disease.
Randall W. Reyer, Ph.D. (Yale U.). Regeneration and developmental biology.
Richard C. Wiggins, Ph.D. (Duke U.)—Chairperson. Neurochemistry, myelination and neuronglia relations.

Associate Professors

Mitchell L. Berk, Ph.D. (Geo. Wash. U.)—Marshall U. Hypothalamic pathways.
Richard D. Dey, Ph.D. (Mich. St. U.). Distribution and function of neural mediators in the airways and their role in asthma, bronchitis, and occupationally related lung diseases.
Morton H. Friedman,* Ph.D. (U. Tenn.). Preprofessional advising, Educational administration, Student affairs.
Rumy A. Hilloowala,* Ph.D. (U. Ala.). History of medicine, Physical anthropology, Primatology (craniofacial structure).
David A. Labowsky, M.D. (U. Penn.). Orthopedics and tendon repair.
Dennis O. Overman, Ph.D. (U. Mich.). Experimental teratology, especially abnormal craniofacial development, Organ culture.
Robert S. Pope,* Ph.D. (U. N. Dak.). Electron microscopic structural and cytochemical aspects of intra- and intercellular development of mammalian female gamete *under in vivo* and *in vitro* conditions.
J. Michael Sorrell, Ph.D. (Temple U.). Immunocytochemistry of extracellular matrix.
Elizabeth R. Walker, Ph.D. (WVU). Electron microscopy and immunocytochemistry of extracellular matrix components in connective tissue disease.

*Associate Member

Ruu T. Wang, Ph.D. (S. Ill. U.)—Marshall U. Comparative neuroanatomy of centrifugal pathway to retina, Postnatal neurogenesis in vomeronasal epithelium, TEM/SEM.

Sasha Zill, Ph.D. (U. Colo.)—Marshall U. Neuroanatomy.

Assistant Professor

Stephen E. Fish, Ph.D. (U. Calif.)—Marshall U. Neuroanatomy.

Gary E. Pickard, Ph.D. (U. Wisc.) Structural and functional organization of vertebrate circadian systems.

Paulinus J. Sorg, Ph.D. (M.C. Va.). Physiology of muscle contraction.

Biochemistry

Professors

Diana S. Beattie, Ph.D. (U. Pitt)—Chairperson. Mitochondrial biogenesis, Mitochondrial metabolism, Heme biosynthesis, Interrelationship of heme and protein synthesis.

James B. Blair, Ph.D. (U. Va.). Intermediary metabolism, Hormonal regulation of hepatic carbohydrate metabolism.

Fred R. Butcher, Ph.D. (Ohio St. U.). Hormone action, Regulation of exocytosis, Calcium.

William J. Canady, Ph.D. (Geo. Wash. U.). Enzyme kinetics.

John P. Durham, Ph.D. (Ohio St. U.). Control of cell proliferation.

Charles L. Harris, Ph.D. (U. Ill.). Structure and function of transfer RNA, RNA synthesis in mammalian cells.

Frederick J. Lotspeich, Ph.D. (Purdue U.)—Marshall U. Effect of beta-carotene and vitamin A on tumors and carcinogenesis.

Michael R. Miller, Ph.D. (Penn St. U.). Regulation of DNA metabolism, DNA replication, Repair in mammalian and fish cells.

Gale W. Rafter, Ph.D. (U. Wash.). Chemistry of host-parasite relationship.

George P. Tryfates, Ph.D. (Rutgers U.). Nutritional oncology.

George H. Wirtz, Ph.D. (Geo. Wash. U.). Immunochemistry.

Associate Professors

Kenneth E. Guyer,* Ph.D. (Ohio St. U.)—Marshall U. Lipid metabolism, Glycerol ethers.

Michael R. Moore, Ph.D. (U. Ga.)—Marshall U. Estrogen receptors in human breast cancer, Estrogen-responsive proteins in breast cancer, Relationship of estrogen action and histone acetylation.

Vernon E. Reichenbecher,* Ph.D. (Duke U.)—Marshall U. Molecular biology, Monoclonal antibody production, Somatic cell genetics, Structure and function of mammalian ribosomes.

Mary J. Wimmer, Ph.D. (U. N.C.). Mechanisms and regulation of enzyme-catalyzed reactions.

Assistant Professors

Marilyn I. Evans, Ph.D. (U. Wash.). Hormonal regulation of genes.

Kent E. Vrana, Ph.D. (LSU). Molecular biology of nervous system.

Research Assistant Professors

Kathleen P. Brooks, Ph.D. (U. Calif.—Davis). Enzymology of the electron transport chain of mitocheridia.

Terence Spearman,* Ph.D. (U. Manitoba, Canada). Regulation of intracellular effects by external stimulation (i.e., second messengers, protein phosphorylation).

Microbiology

Professors

Robert G. Burrell, Ph.D. (Ohio St. U.). Immunology, Mechanisms of immune injury in non-infectious pulmonary diseases.

Nyles Charon, Ph.D. (U. Minn.). Medical bacteriology, Genetics and physiology of spirochetes.

John Hall,* Ph.D. (Purdue U.). Parasitology, Bacterial endosymbionts of free-living amebae.

Albert G. Moat,* Ph.D. (U. Minn.)—Marshall U. Biosynthesis and metabolism of amino acids, B vitamins, and purines.

Maurice A. Mufson, M.D. (NYU)—Marshall U. Infectious disease microbiology, Respiratory pathogens.

Stephen A. Olenchock, Ph.D. (WVU)—Adjunct. Immunology, Study of immunological reactions in occupational lung disease.

Robert S. Pore, Ph.D. (U. Calif.). Mycology, Pathobiology of *Prototheca* sp. and the mycoses, Biotechnology projects include microbial bioconcentration and biopolymer production.

Irvin S. Snyder, Ph.D. (U. Kans.)—Chairperson. Medical bacteriology, Mechanisms of pathogenicity, Clinical microbiology.

Associate Professors

Stephen C. Aronoff, M.D. (U. Pitt.). Microbiology of cystic fibrosis, Infectious disease, Microbial resistance to antibiotics.

*Associate Member

Terry W. Fenger, Ph.D. (S. Ill. U.)—Marshall U. Measles virus proteins, Viral etiology of multiple sclerosis, Membrane proteins of virus-infected cells.

Vincent F. Gerencser, Ph.D. (U. Ky.). Dental microbiology, Hemagglutinin of *Bacteroides* species, Anaerobic bacteriology of infected dental pulps in children.

Eric H. Humphries, Ph.D. (U. Wisc.). Retrovirus replication, Tumor biology.

Kenneth S. Landreth, Ph.D. (U. Wash.). Immunology, Developmental immunobiology, Lymphopoiesis.

Bryan Larsen, Ph.D. (U. Iowa)—Marshall U. Medical microbiology, Antimicrobial agents and chemotherapy, Obstetrical microbiology.

Daniel M. Lewis, Ph.D. (WVU)—Adjunct. Immunology, Mechanism of immunological reactions in the lung.

Henry F. Mengoli,* Ph.D. (Cath. U.). Medical bacteriology, Bacterial Fc receptors, Intestinal colonization and ankylosing spondylitis.

William G. Sorenson, Ph.D. (U. Tex.)—Adjunct. Immunology, Immunotoxic reactions to grain dust components.

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Assistant Professors

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Pharmacology and Toxicology

Professors

A. J. Azzaro, Ph.D. (WVU). Uptake, release, and metabolism of CNS neurotransmitter substances.

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Michael G. Mawhinney, Ph.D. (WVU). Connective-tissue metabolism in male sex accessory tissues, Endocrine pharmacology of prostatic cancer.

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Robert E. Stitzel, Ph.D. (U. Minn.)—Co-Chairperson. Mechanism of action of antihypertensive agents, Biochemical factors influencing vascular reactivity.

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Associate Professors

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Carl A. Gruetter, Ph.D. (Tulane U.)—Marshall U. Pharmacology and physiology of vascular smooth muscle, Cyclic nucleotides and calcium in vascular mechanisms.

Jeannine S. Strobl, Ph.D. (Geo. Wash. U.). Estrogen receptor mechanisms.

Monica A. Valentovic, Ph.D. (U. Ky.)—Marshall U. Prostaglandins, diabetes and glucose.

Assistant Professors

Dale L. Birkle, Ph.D. (Va. Commonwealth U.). Membrane lipids and lipid-derived autocoids as regulators of neurotransmissions.

William H. Houser, Ph.D. (U. Mich.). Regulation of cytochrome P-450c expression, chemical carcinogenesis.

*Associate Member

Mark A. Simmons, Ph.D. (Loyola U.—Chicago)—Marshall U. Neuropharmacology.
John L. Szarek, Ph.D. (U. Ky.)—Marshall U. Pulmonary pharmacology.
Marcus C. Waldron, Ph.D. (Clemson U.)—Marshall U. Environmental toxicology.
Jennings F. Worley, III, Ph.D. (U. Md.). Single channel recordings, Patch clamp techniques.

Physiology

Professors

Paul B. Brown, Ph.D. (U. Chicago). Neurophysiology, Neuroanatomy.
Vincent Castranova, Ph.D. (WVU)—Adjunct. Regulation of membrane transport.
Ludwig Gutmann,* Ph.D. (Columbia U.). Human neuromuscular disorders.
George A. Hedge, Ph.D. (Stanford U.)—Chairperson. Thyroid and adrenocortical neuroendocrinology.
Michael D. Johnson, Ph.D. (U. Mich.). Renal and cardiovascular physiology.
Theodore A. Kotchen, M.D. (Case West. Res. U.). Renin and regulation of hypertension.
Ping Lee, Ph.D. (Duke U.). Membrane transport.
Philip R. Miles, Ph.D. (WVU)—Adjunct. Cellular physiology of the lung.
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William T. Stauber, Ph.D. (Rutgers U.). Muscle adaptation/injury, Proteases, Lysosomes.
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Associate Professors

L. Howard Aulick, Ph.D. (Indiana U.)—Marshall U. Burn hypermetabolism.
Christine Baylis, Ph.D. (Leeds U.). Renal and systemic hemodynamics.
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Gunter N. Franz, Ph.D. (U. Wash.). Voltage clamping of cell membranes and lung mechanics.
David G. Frazer, Ph.D. (Penn St. U.)—Adjunct. Examination of mechanical properties of excised lungs.
Wil E. Gladfelter, Ph.D. (U. Penn). Hypothalamic control of the excitability of the motor system.
Robert L. Goodman, Ph.D. (U. Pitt). Neuroendocrine control of ovarian function.
John Hankinson, Ph.D. (WVU)—Adjunct. Occupational respiratory diseases.
William D. McCumbee, Ph.D. (U. Houston)—Marshall U. Cartilage metabolism.
Ronald Millecchia, Ph.D. (Rockefeller U.). Neurophysiology.

Assistant Professors

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Linda J. Huffman,* Ph.D. (U. Nebr.)—Research. Neuroendocrinology, Thyroid axis.
Edwin C. Johnson, Ph.D. (Purdue U.)—Marshall U. Neurophysiology.
Mieczyslaw Michalkiewicz,* Ph.D. (U. Warsaw)—Research. Thyroid and pituitary, Neuroendocrinology.
Stanley Yokota, D.V.M. (U. Worclaw), Ph.D. (U. Calif.—Riverside). Renal physiology, Microcirculation, Osmoregulation.

School of Medicine

Medical Technology

Professors

Jean D. Holter,* Ed.D. (WVU)—Program Director. Medical technology, Chemistry, Instrumentation.
Richard M. Iamarino, M.D. (Loyola U.). Director, Clinical Laboratories. Pathology, Biochemistry.
Nathaniel F. Rodman, M.D. (U. Penn). Pathology, Coagulation.

Associate Professor

Singanallur N. Jagannathan, Ph.D. (U. Bombay). Pathology, Biochemistry.

College of Mineral and Energy Resources

Mining Engineering

Professors

Lawrence Adler, Ph.D. (U. Ill.). Mine machinery, Exploration.
A. Wahab Khair, Ph.D. (Penn St. U.). Rock mechanics, Ground control.
Syd S. Peng, Ph.D. (Stanford U.)—Chairperson. Ground control, Longwall mining, Respirable dust.

*Associate Member

Ronald R. Rollins, Ph.D. (U. Utah). Explosives applications, Explosives theory.
Y. J. Wang, Ph.D. (Penn St. U.). Mine ventilation, Computer application, Mine design.

Associate Professor

Robert L. Grayson, Ph.D. (WVU). Mine management/ventilation, Health and safety.

Petroleum Engineering

Professor

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Associate Professors

Samuel Ameri, M.S.P.E. (WVU)—Chairperson. Geophysical well-log interpretations, Reservoir engineering, Design and application.

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Assistant Professor

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Mineral Processing Engineering

Professor

Eung Ha Cho, Ph.D. (U. Utah). Hydrometallurgy, Environmental science.

Associate Professor

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Mineral Resource Economics

Professors

Dale K. Colyer, Ph.D. (U. Wis.). Adjunct. Production economics, Finance.

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William Miernyk, Ph.D. (Harvard U.). Benedum. Emeritus.

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Adam Z. Rose, Ph.D. (Cornell U.) Adjunct. Energy resources, Regional development.

Associate Professors

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Assistant Professor

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Particle Analysis Center

Professor

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School of Nursing

Professors

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Lorita Jenab,* Ed.D. (Columbia U.). Dean.

Mary Jane Smith, Ph.D. (NYU).

Associate Professors

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Thomas Schaal,* Ph.D. (WVU).

Patricia Simoni,* Ed.D. (WVU).

Jacqueline Stemple,* Ed.D. (WVU).

Janet Wang,* Ph.D. (U. Pitt).

Assistant Professor

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*Associate Member

School of Pharmacy Pharmaceutical Sciences

Professors

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David Lalka, Ph.D. (SUNY-Buffalo). Pharmacokinetics, Biochemical pharmacology
James K. Lim, Ph.D. (U. N.C.). Pharmaceutical product formulation studies, Fluorides and dental antiplaque agents, Semisolid rheology.
Joseph H.K. Ma, Ph.D. (Duquesne U.). Pharmaceutical chemistry.
Carl J. Malanga, Ph.D. (Fordham U.). Biopharmacy, Pharmacology and physiology of mucociliary transport, Mucus synthesis and secretion.
Jay Nematollahi,* Ph.D. (U. Calif.). Adjunct. Medicinal chemistry.
Frank D. O'Connell,* Ph.D. (Purdue U.). Isolation of natural products, Biochemical transformations in plant tissue cultures.
John P. O'Donnell, Ph.D. (U. Iowa). Adjunct. Medicinal chemistry.
David A. Riley, Ed.D. (U. Ga.). Continuing education, Behavioral and administrative pharmacy.
Sidney A. Rosenbluth, Ph.D. (U. Tex.)—Dean. Development and evaluation of expanded pharmacists' roles in health care delivery, Development and evaluation of educational units and their effects on professional behavior.
Ashok C. Shah, Ph.D. (U. Wisc.). Adjunct. Pharmaceutics.

Associate Professors

Marie A. Abate, Pharm.D. (U. Mich.). Drug information, Adult internal medicine.
David B. Brushwood, J.D., (U. Kans.). Pharmacy administration, Drug regulation, Health law and ethics.
Douglas D. Glover, M.D. (Emory U.). Drugs in pregnancy and lactation.
Robert Griffith, Ph.D. (Ohio St. U.). Medicinal chemistry, Enzyme inhibitors and antifungal agents.
Charles D. Ponte, Pharm.D. (U. Utah). Clinical pharmacy, Family practice.

Assistant Professors

Mary Castiglia, Pharm.D. (Med. U.S.C.). Clinical pharmacy.
David P. Elliott, Pharm.D. (U. Texas). Optimizing drug therapy in the elderly.
Peter M. Gannett, Ph.D. (U. Wisc.). Metabolism and carcinogenesis of alkyl hydrazines.
Gerald M. Higa,* Pharm.D. (U. Pacific). Hematology and oncology.
Nahla Khoury,* Ph.D. (WVU). Adjunct. Pharmaceutics.
Lee E. Kirsch, Ph.D. (Ohio St. U.). Adjunct. Pharmaceutics.
Sundareswaran (Suresh) Madhavan, Ph.D. (Purdue U.). Health care and pharmaceutical marketing, Marketing research, Entrepreneurship and small business management.
Gene H. Makela,* Pharm.D. (Med. U., S. Caro.). Psychopharmacology and schizophrenia.
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Paula Jo Meyer Stout, Ph.D. (WVU). Pharmaceutics, Dissolution models, Industrial pharmacy/product formulation.
James C. Stevenson, Pharm.D. (Wayne St.U.). Adjunct. Cardiovascular drug therapy, Clinical pharmacy services administration.
Gregory P. Wedin, Pharm.D. (U. Minn.). Epidemiology, clinical toxicology.
Yongyt Rojanasakul, Ph.D. (U. Wisc.). Pharmaceutics, Transport phenomena in biological systems.
Mohamadi Sarkar, Ph.D. (MCV). Pharmacokinetics, Drug metabolism.

School of Physical Education

General Program

Associate Professor

Mary K. Wiedebusch,* M.A. (WVU). Dance in higher education, Creative dance for children, Physical education.

*Associate Member

Health, Physical Education and Athletic Training

Professors

Carl P. Bahneman, Ph.D. (U. Pitt)—Chairperson. Teacher behavior, Administration.
J. William Douglas, Ph.D. (Ohio U.)—Dean. Management theory, history and philosophy of sport.
Robert L. Wiegand, Ed.D. (U. Ga.). Physical education, Teacher preparation, Special physical education.

Associate Professors

Linda M. Carson,* (WVU). Physical education, Motor development, Early childhood physical education.
Andrew H. Hawkins, Ph.D. (Ohio St. U.). Physical education, Teacher education, Special physical education.
Daniel Ziatz,* Ph.D. (U. Utah). Pedagogy, Coaching education, Curriculum.

Assistant Professors

Karen K. Douglas,* Ph.D. (Tex. Wom. U.). Health education, Wellness, Curriculum development.
Greg A. Ott,* M.S. (U. Ariz.). Physical education, Athletic training, Physical therapy.

Safety

Professors

Daniel E. Della-Giustina, Ph.D. (Mich. St. U.)—Chairperson. Safety management services, Sports safety, Transportation safety.
Kenard McPherson, Ed.D. (Mich. St. U.). Safety management, Alcohol and transportation research.

Associate Professors

Pete Shaffron, Jr., Ed.D. (WVU). Safety studies, Driver and traffic safety education, Safety education.
Andrew Sorine, Ed.D. (WVU). Safety studies/management/education.

Assistant Professor

Gary Winn,* Ph.D. (Ohio St. U.). Safety studies, Transportation.

Sport and Exercise Studies

Professors

Robert L. Kurucz,* Ph.D. (Ohio St. U.). Kinesiology, Biomechanics, Exercise physiology.
Andrew C. Ostrow, Ph.D. (U. Calif.—Berkeley). Physical education, Sport psychology, Physical activity and aging.
Rachel Yeater, Ph.D. (WVU). Exercise physiology, Exercise and osteoporosis, Cardiac/rehabilitation.

Associate Professors

William L. Alsop,* Ed.D. (WVU)—Chairperson. Sport studies, Sport management.
Dana Brooks, Ed.D. (WVU). Physical education, Social psychological aspects of sport, Youth sport.

Reproductive Physiology

Professors

Roy L. Butcher, Ph.D. (Iowa St. U.). Aging as a factor in reproduction, superovulation and embryonic anomalies.
William E. Collins,* Ph.D. (U. Wisc.). Endocrinology of bovine reproduction.
Robert A. Dailey, Ph.D. (U. Wisc.). Neuroendocrine control of reproduction, Follicular development, Ovulation.
Donald J. Horvath,* Ph.D. (Cornell U.). Reproductive management of swine, Nutritional factors.
E. Keith Inskeep, Ph.D. (U. Wisc.). Uterine and ovarian prostaglandins in sheep and cattle.
Paul E. Lewis, Ph.D. (WVU). Puberty, Postpartum and seasonal anestrus as limiting factors in reproduction.
Michael G. Mawhinney, Ph.D. (WVU). Endocrine pharmacology and metabolism of male sex accessory tissues.
Joginder Nath, Ph.D. (U. Wisc.). Genetics and evolution.

Associate Professor

Robert L. Goodman, Ph.D. (U. Pitt). Neuroendocrine control of ovarian function.

Adjunct Professor

Robert Cochrane, Ph.D. (U. Wisc.). Reproduction in laboratory and fur animals.

*Associate Member

School of Social Work

Professors

Sung Lai Boo, Ph.D. (Fla. St. U.). Social policy, Cross-cultural practice.
Nancy L. Lohmann, Ph.D. (Brandeis U.). Social gerontology, Research measurement.
Roger A. Lohmann, Ph.D. (Brandeis U.). Non-profit management, Social gerontology, Rural social services.
Michael A. Patchner, Ph.D. (U. Pitt)—Dean. Gerontology, Health care of the elderly, Rural social services.
Robert A. Porter, Ph.D. (Brandeis U.). Ecology, Community development, Ethnography.
LeRoy G. Shultz,* M.S.W. (Wash. U.). Victimology, Forensic social work.

Associate Professors

Patty A. Gibbs, Ed.D. (WVU)—Acting BSW Program Director. Death and dying, Women's issues.
John F. Isaacson,* M.S.W. (U. Penn)—Acting Coordinator of Field Instruction. Family life theory, Homosexuality.

Assistant Professors

Barry Locke,* Ed.D. (WVU)—Acting Assistant Dean. B.S.W. curriculum, Social work in rural areas and small towns, Program planning.
John A. Peters,* M.S.W. (WVU). Locality development, Community mental health practice in rural areas.

Clinical Assistant Professor

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Women's Studies

Professor

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*Associate Member

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